THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—Linnæus.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—Bruckner, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. Taylor, *Norwich*, 1818.

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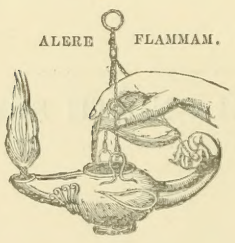

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

"..... perlucidi, purgite, musæum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et puerum divæ replete canistrum.
At vos, o Nymphæ Cretenides, ite sub undas.
Ite, recurvato variata corallia trunco
Vestite, muscosa et rupibus, et antra comchas
Ferte. Deæ pelagi, et pingui conchylia succo."

N. Perthcarn Germanicus, Ecl. I.

No. 67. JULY 1923.

I.—*A Revision of the Malayan and Indian Species of the Melyrid Subfamily* Carphurinæ *represented in the Hope Collection at Oxford and in the British Museum in London* [*Coleoptera*]. By G. C. Champion, F.Z.S.

[Plate I.]

The present paper is a result of a prolonged study of the numerous Carphurinæ captured long ago by Wallace in New Guinea, the Moluccas, or the Malayan Archipelago, and of various collections made in later years by Doherty *, C. F. Baker †, G. E. Bryant, G. Lewis, H. E. Andrewes, and others in the same regions, or in Japan, Ceylon, or continental India. Nearly seventy species are represented in the material examined, five only of which had been identified up to the present time. Upwards of 200 members of the

* This excellent American collector, who died in hospital at Nairobi, E. Africa, on May 25th, 1893, visited the various Malayan Islands, &c., mentioned here between 1887 and 1893: see Hartert, Nov. Zool. 1901, pp. 494-504.

† Since this paper has been in type Mr. Baker has communicated some additional material from the Philippines &c. The study of the new forms sent must be deferred for the present.

group have been described, three-fourths of which are Australian. The only author who has paid any serious attention to them is Mr. A. M. Lea, of the Adelaide Museum, and his studies were restricted to the Australian fauna. He was the first to call attention to the ♂ tarsal comb (see text-figs. 1, 2, 4), a character overlooked by all other writers on these insects. The Carphurinæ should be removed from the "Malachiides" of Lacordaire and treated as a separate subfamily of the Melyridæ, characterized by the more or less abbreviated elytra in the two sexes, leaving a considerable portion of the abdomen exposed; the lobed tarsal joints 2–4, 3 and 4, or 4 (4 dilated and appearing bilobed as seen from above in *Carphurus*, and quite small in *Carphuroides*), the first joint of the anterior pair always with a black comb beneath in the ♂; the presence of extensible vesicles at the sides of the prothorax and abdomen; and the simple structure of the terminal abdominal segments in the ♂. Three or four species only amongst the Malayan insects examined exhibit any marked cephalic structure in the ♂. The small narrow black forms are very like Telephorids of the genera *Malthodes*, &c. *Carphuroides* is also represented by single species in Rhodesia, Tropical America, and the Hawaiian Islands, but its real home must be in the Indo-Malayan region.

Dr. Waterston has been kind enough to dissect for me the genitalia of both sexes of *Carphurus basalis*, a ♂ of *C. pengaronæ*, and a ♂ of *Carphuroides dentiger*. The excellent preparations made by him, and drawn by M. Terzi, are shown on text-figures 1–4. The explanation of the ♂ and ♀ structures of *C. basalis* is given on Dr. Waterston's authority. So far as I am aware, the ♂-armature of a *Carphurus* has not hitherto been described or figured, and it proves to be different from that of any of the Telephorids known to me. The intromittent organ is simple in structure, but the long eversible tube in which it is contained is armed with sharp projecting teeth, these latter varying in position according to the species. Lea, in 1919, could only find the penis-sheath.

Choresine.

Choresine, Pascoe, Journ. Ent. i. p. 49 (April, 1860).

Choresine, type *C. advena*, ♂, based upon a single species from Batchian, was referred to the Cleridæ by Pascoe. The ♀ of that insect is now described and four others added, all captured by Wallace in the Moluccas or in New Guinea.

The presence of a tarsal comb in the ♂, and the extensible vesicles of the prothorax and abdomen, bring this genus near *Carphurus*, from which it is separable by the abruptly constricted prothorax, the narrow basal portion of the latter being somewhat produced, transversely sulcate or deeply excavate, and received into the hollowed base of the elytra. The inflation of the elytra in the fully-developed ♂ of *C. advena* is homologous with that of certain species of the S. American Melyrid-genus *Chalchas*, Blanch.; but this peculiarity is wanting in the ♀ of the same species, and in the new forms here noticed. Two of them are wholly metallic above; the others (including *C. advena*) have the head and prothorax testaceous and the elytra cyaneous. All have rather stout filiform antennæ, and one (*C. bicolorata*) has an elongated basal joint to the anterior tarsi in the ♂, as in *Carphurus rouyeri*, Pic. The tarsal joints 2–4 or 3 and 4 are excavate and widened, appearing bilobed as seen from above, as in *Carphurus* and *Balanophorus*.

1. *Choresine advena.* (Pl. I. figs. 1, 1 *a*, ♂; 2, ♀.)

♂. *Choresine advena*, Pasc. Journ. Ent. i. p. 49, t. 2. fig. 2 (1860).

♂. Elytra usually greatly inflated, emarginate at the base for the reception of the narrow basal portion of the prothorax, the humeri thus appearing to extend forwards; anterior tarsal joint 1 rather narrow, about as long as 2, nigro-pectinate in its outer half beneath (fig. 1 *a*); terminal dorsal segment of abdomen broadly arcuate-emarginate at tip.

♀. Elytra less inflated, feebly emarginate at base, the humeri not so prominent in front; anterior tarsal joint 1 without comb.

Hab. Moluccas &c., Batchian [type], Mysol, Waigiou, Gilolo (*Wallace, in Mus. Brit. and Mus. Oxon.*).

Eight specimens of this species are before me, including the type (♂). It is easily recognizable by the broad, laterally rounded, greatly inflated, cyaneous elytra (leaving three or four abdominal segments exposed*) of the ♂, the testaceous head, antennæ, prothorax, and legs, and the black metasternum; the long, stout, filiform antennæ; and the abruptly constricted, deeply transversely sulcate base of the prothorax. The head and antennæ are similarly formed in the two sexes. The four hinder tibiæ are furnished with long blackish hairs, and the tarsal joints 3 and 4 are sometimes infuscate.

* One only is shown in Pascoe's bad figure.

2. *Choresine bicolorata*, sp. n. (Pl. I. figs. 3, 3 *a*, ♂.)

♂. Elongate, rather broad, shining, pubescent; testaceous; the eyes, metasternum, and penultimate tarsal joints black or piceous, the scutellum and elytra violaceous; the head and prothorax minutely, the elytra densely, rugulosely punctured. Head (with the eyes) about as broad as the prothorax; antennæ long, stout, filiform. Prothorax as long as broad, abruptly constricted and narrowed posteriorly; very deeply transversely sulcate before the base and also on each side anteriorly. Elytra much wider than, and nearly three times the length of, the prothorax, leaving four abdominal segments exposed, subparallel, rounded at the sides anteriorly, flattened on the disc. Legs stout, finely pubescent; anterior tarsal joint 1 thickened, as long as 2–4 united, nigro-pectinate along the entire lower edge (fig. 3 *a*). Terminal dorsal segment of abdomen arcuate at tip.

♀. Anterior tarsi without comb; elytra a little broader.

Length 5–5½ mm.

Hab. New Guinea, Dorey [♀], and Waigiou [type ♂] (*Wallace, in Mus. Oxon.*).

One pair. A close ally of *C. advena*, Pasc., with flattened subparallel elytra and a long basal joint to the anterior tarsi (which is nigro-pectinate along the entire lower edge in ♂), the four hinder tibiæ without longer hairs.

3. *Choresine buruensis*, sp. n.

♀. Very elongate, shining, clothed with fine pubescence intermixed with longer shaggy hairs, the tibiæ also hairy; the head (the eyes excepted), the antennal joints 1–6 in great part, prothorax, abdomen, and femora testaceous, the metasternum and the rest of the antennæ and legs black or piceous, the elytra fusco-violaceous; the head finely, the prothorax very sparsely, and the elytra densely, rugulosely punctured. Head not wider than the prothorax, rather small, feebly bi-impressed between the eyes; antennæ long, stout, thickening outwards, the joints subcylindrical, 6–11 gradually increasing in length, all longer than broad. Prothorax convex, narrow, rounded at the sides and abruptly constricted before the base, the narrow basal portion produced, truncate and raised behind, and deeply transversely excavate, the disc also transversely sulcate anteriorly. Elytra rather convex, rounded at the sides and tip (as seen from above), at the middle about three times the width of the prothorax, leaving five segments exposed. Anterior

tarsal joint 1 small, without comb. Intermediate and posterior tibiæ thickened and slightly curved.

Length 4½ mm.

Hab. Moluccas, Buru (*Wallace, in Mus. Oxon.*).

One ♀. Much smaller than the same sex of *C. advena*, Pasc., the prothorax narrower and more convex, the elytra less inflated, the antennæ in part, and the tibiæ and tarsi, black, the tarsi less dilated.

4. *Choresine moluccana*, sp. n. (Pl. I. fig. 4, ♀.)

♀. Moderately elongate, rather broad, shining, pubescent; nigro-cyaneous, the mouth-parts and basal joints of the antennæ pale testaceous, the rest of the latter nigro-piceous; the head and prothorax closely punctured, the latter smoother on the disc and rugose at the sides, the elytra finely, rugulosely punctate. Head as broad as the prothorax, foveate in the middle between the eyes; antennæ very long, stout, filiform, thickening outward, joints 4–11 much longer than broad. Prothorax convex, a little longer than broad, abruptly constricted and narrowed before the base, the transverse basal excavation very deep. Elytra broad, about twice the length of, and at the base not much wider than, the prothorax, leaving four abdominal segments exposed, rounded at the sides and apex. Legs short; anterior tarsal joint 1 short, without comb.

Length 3¼ mm.

Hab. Moluccas, Batchian (*Wallace, in Mus. Oxon.*).

One example. Distinguishable by its short form, small size, and cyaneous coloration; the antennæ stout and very elongate, pale at the base; the thorax unimpressed anteriorly, the basal excavation deep; the elytra broadly oboval, comparatively short.

5. *Choresine nigroviolacea*, sp. n.

♂. Very elongate, shining, the elytra duller, finely pubescent; nigro-violaceous, the prothorax purplish on the disc, the antennæ (the testaceous lower surface of joints 1–5 excepted) black; the head and prothorax closely, finely punctate, the latter smoother on the disc and rugulose at the sides, the elytra densely, rugulosely punctured. Head about as wide as the prothorax, strongly, obliquely bi-impressed between the eyes; antennæ very elongate, rather slender, subfiliform, joints 7–11 much longer than those preceding. Prothorax convex, not longer than broad,

somewhat rounded at the sides, angularly, abruptly constricted before the base, the short basal portion narrow; with a very deep transverse excavation before the base and also transversely sulcate anteriorly. Elytra somewhat flattened, a little widened posteriorly, rounded at the tip, leaving four segments exposed. Anterior tarsal joint 1 nearly as long as 2–4 united, nigro-pectinate along the lower edge.

Length 6 mm.

Hab. New Guinea (*Wallace, in Mus. Oxon.*).

One specimen, ♂, exact locality not recorded. A large metallic form, with very long, subfiliform antennæ, a strongly constricted, basally-excavate prothorax, and long, densely rugulose elytra. The basal constriction of the prothorax is stronger than in *C. advena*, Pasc.

Neocarphurus.

Neocarphurus, Lea, Proc. Linn. Soc. N.S.W. 1898, p. 580; Trans. Ent. Soc. Lond. 1909, p. 211, pl. 2. fig. 6.

The nine species of this genus described by Lea are all Australian, some of them being confined to Queensland. Two small forms found in Ceram and Timor respectively are here referred to it. They differ from *Carphurus* in having the prothorax constricted into a narrow neck behind, and deeply excavate before the base, the basal margin thus appearing raised; but the constriction is less abrupt than in *Choresine*.

1. *Neocarphurus annulipes*, sp. n. (Pl. I. figs. 5, 5 *a*, ♂.)

♂. Elongate, narrow, shining, the elytra opaque, finely pubescent; nigro-piceous, the anterior portion of the head, the antennal joints 1–8, the basal margin of the prothorax, a transverse fascia on the elytra below the base (not reaching the suture), the coxæ in great part, the bases of the femora, and a spot near the apices of the anterior and intermediate pairs, and the apices of the tarsi, testaceous or flavous. Head wider than the prothorax, bisulcate in front, and with a transverse, mesially foveate, V-shaped groove between the eyes above; antennæ very elongate, slender, filiform. Prothorax very convex, elongato-cordate, strongly constricted posteriorly, the basal portion narrow, transversely sulcate; the surface obliquely, longitudinally strigose laterally and smooth along the middle, the gibbous portion of the disc bordered on each side by a narrow, sharply-defined, longitudinal groove (fig. 5 *a*). Elytra about as long as the head

and prothorax, not wider than the head, oblongo-quadrate, parallel, flattened on the disc, sinuate at the base, the humeri angular in front and obliquely carinate; the surface-sculpture extremely fine, the apices truncate, leaving four segments exposed. Tarsal joints 3 and 4 slightly widened and produced, 1 of anterior pair feebly curved, as long as the others united, narrowly nigro-pectinate along the entire lower edge.

Length 2¼ mm.

Hab. Moluccas, Ceram (*Wallace, in Mus. Oxon.*).

One ♂. The basally excavate, posteriorly constricted prothorax of this insect gives it the general facies of a *Troglops*; but the tarsal structure agrees with that of *Carphurus*. The flavous markings on the femora are conspicuous and almost transparent. *N. annulipes* is not unlike *N. angustibasis*, Lea (1921), from Queensland, specimens of which have been presented to the British Museum by the author.

2. *Neocarphurus stenoderus*, sp. n.

♂. Elongate, narrow, shining, finely pubescent, with longer hairs intermixed; piceous, the head and prothorax fusco-testaceous, the antennal joints 1–3 and legs testaceous or obscure testaceous, the rest of the antennæ and the eyes black; the entire upper surface densely, rugulosely punctulate, the prothorax rougher at the sides anteriorly. Head very broad, deeply foveate in the middle between the eyes, the latter large and convex; antennæ extremely elongate, nearly as long as the body, subfiliform, joint 2 short, 3 a little longer than 2, 4–11 elongate, gradually increasing in length. Prothorax narrow, compressed, longer than broad, constricted and transversely excavate before the base. Elytra much wider than the prothorax, depressed, parallel, long, subtruncate at the tip, leaving three abdominal segments exposed, a little widened posteriorly. Legs elongate, slender; anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the lower edge.

Length 3 mm.

Hab. Timor, Mt. Leo, alt. 2000–4000 feet (*Doherty*).

One male. More elongate than *N. annulipes*, ♂, the antennæ extremely elongate; the head very broad, and with prominent large eyes; the prothorax narrow, laterally compressed, and less rounded at the sides; the elytra much more elongate; the entire surface rugulose; the legs more elongate. The unusually long elytra and broad head give this species a facies different from that of *Carphurus*; but

the presence of a tarsal comb shows that it belongs to the same group.

Microcarphurus brunneiventris, Pic (1917), type ♀, from Aru, diagnosed in ten words, may be an allied form?

Brachyhedybius.

Brachyhedybius, Pic, Mélanges exot.-entom. xxv. p. 10 (1917).

This genus, if correctly identified here, is based upon the ♂ of a New Guinea insect found in numbers by Wallace. It is closely related to *Carphurus*, Er., from which it differs in having the elytra shorter, laterally dilated, and sinuate and dehiscent at the apex, thus resembling an *Ichthyurus*. The ♀ has differently coloured, undilated elytra. The generic name is inappropriate, *B. sinuatus* bearing no resemblance to any *Hedybius* known to me.

1. *Brachyhedybius sinuatus*. (Pl. I. figs. 6, 6 *a*, ♂.)

♂. *Brachyhedybius sinuatus*, Pic, Mélanges exot.-entom. xxv. p. 10 (1917).

♂. Very elongate, robust, shining, finely pubescent, the head, prothorax, femora, tibiæ, and abdomen with long erect or projecting hairs; testaceous, the eyes, the antennæ to a variable extent (the basal joints beneath and the outer joints within excepted), and abdomen black, the elytra flavous, the apical margin slightly infuscate in one specimen. Head long, large, obliquely narrowed behind, finely punctured, transversely strigose at the base, deeply 5-foveate between the eyes, the three upper foveæ confluent and together forming a transverse sulcus, the other two limited externally by a short curved ridge and separated from the rest by three transversely-placed pilose tubercles (fig. 6 *a*); eyes very large, prominent; antennæ long, broad, strongly obliquely serrate. Prothorax oblong-subcordate, deeply transversely excavate on each side before the base and apex; sparsely, finely punctate. Elytra soft, short, about one-half longer and much broader than the prothorax (leaving six abdominal segments exposed), rounded and explanate at the sides, the margins reflexed, the humeri prominent, the apices oblique, sinuate, and dehiscent, and each with an indication of a tumid spot; closely, finely punctured. Abdomen very long. Anterior tarsal joint 1 short, nigro-pectinate along the lower edge.

♀. Head flattened and shallowly trifoveate between the eyes, the latter less prominent; antennæ shorter and less dilated; elytra black, except at the base, subparallel, the

margins not explanate, the apices more rounded; anterior tarsi without comb.

Length 8–10 mm. (♂ ♀.)

Hab. New Guinea [*type of Pic, ♂*], Dorey, Mysol, and Waigiou (*Wallace, Mus. Brit. and Mus. Oxon.*: ♂ ♀).

Fourteen specimens seen, including four males, the latter agreeing with Pic's incomplete description, in which the antennal and tarsal structure is ignored. Both sexes were obtained in Mysol and New Guinea by Wallace, and there can be no doubt that they belong to the same species; the ♀ is extremely like the same sex of *Carphurus* (*Balanophorus*) *apicalis*, Pic (nec Macleay), also from New Guinea, except that it has shorter and more dehiscent elytra. *Balanophorus macassarensis*, Pic, type ♀, also has short elytra; but as the antennæ are described as "subflabellate," the Macassar insect cannot be the ♀ of the present species. An immature ♀ of *B. sinuatus* from Mysol has the disc of the prothorax strigose. The cephalic structure of the ♂ is very like that of *Carphurus laratensis*, infra.

Carphurus.

Carphurus, Erichson, Entomographien, p. 132 (1840) (type, *C. dispar*, ♂); Lea, Trans. Ent. Soc. Lond. 1909, p. 186, and Trans. Roy. Soc. S. Australia, xlv. p. 94 (1921).

Helcogaster, Boheman, Eugen. resa, p. 81 (1858) (type, *H. brachypterus*, ♀); Lea, *loc. cit.* p. 213, and *loc. cit.* p. 107.

This genus includes a very large number of species, and has its headquarters in Australia*, extending in a northwesterly direction through New Guinea, the Moluccas, the Philippines, and the Malayan Archipelago to India, two or three small forms reaching the Himalaya. *Helcogaster*, based on ♀ ♀ only, is accepted by Lea, who relies upon the excavate, tuberculate head of the ♂ ♂ to distinguish it from *Carphurus*. Excluding a few species here placed under the generic name *Carphuroides*, fifty eastern forms are represented in the collections examined, and about twenty others from the same regions have been named by Motschulsky, Bourgeois, or Pic. *Balanophorus*, McLeay, the species of which (according to a recent paper by Lea, Trans. Roy. Soc. S. Austr. xlv. p. 94, 1921) have a tarsal comb in both sexes, and flabellate antennæ in ♂, I have not seen from outside Australia.

The following key should assist in the identification of the

* *C. venustus*, Kirsch (1877), has probably been introduced into the Auckland Isls. It is not known from New Zealand.

species here enumerated; but as ♀ ♀ only are represented in eleven of them, it cannot be based on the ♂-characters alone :—

1 (20). Antennal joint 1 of ♂ normal.
2 (19). Anterior tarsal joint 1 of ♂ shorter, equalling 2 and 3 or 2–4 united.
3 (16). Antennæ dentate, serrate, or subserrate, flabellate in No. 12, in ♂.
4 (5). Prothorax transversely strigose, subquadrate; head foveate or tuberculate in Nos. 1, 2, ♂ .. Species 1-6.
5 (4). Prothorax simply punctured or almost smooth.
6 (7). Body wholly metallic above; head small in ♂. Species 7.
7 (6). Body not or partly metallic above; elytra dentate or angulate at sides below the humeri in Nos. 8, 17, 18, ♂.
8 (9). Body uniformly testaceous; head bicarinate and foveate in No. 8, ♂ ..... Species 8–10.
9 (8). Body not uniformly testaceous.
10 (11). Head entirely or in part and prothorax (except in No. 12 and No. 18, var.) testaceous; elytra metallic in No. 11, vittate in No. 16; abdomen variously coloured; head foveate, plicate, or fasciculate in Nos. 17, 18, ♂ .... Species 11-21.
11 (10). Head (except in front in Nos. 22, 23) and prothorax infuscate.
12 (13). Prothorax and elytra more or less metallic; abdomen (except in vars.) wholly or in part testaceous; elytra sometimes with a testaceous lateral stripe; antennæ short, serrate . Species 22, 23.
13 (12). Prothorax and elytra not or faintly metallic.
14 (15). Body black; the elytra usually with a large whitish or testaceous space on the disc or at the sides in No. 24, and the base abruptly testaceous in No. 25 ..... Species 24, 25.
15 (14). Body black or piceous, the abdomen sometimes in part rufescent in No. 26, the head reddish in front in No. 30; species moderate in size, or small and resembling *Malthodes* (Nos. 31–33). Species 26-33.
16 (3). Antennæ more feebly serrate or subfiliform.
17 (18). Body testaceous (No. 34), the elytra black in No. 35 ..... Species 34, 35.
18 (17). Body black or piceous, the head and prothorax testaceous or rufo-testaceous in Nos. 36, 37, the legs yellow in No. 38, the abdomen in part or wholly testaceous in Nos. 42 and 44, var.; upper surface rough in No. 39.... Species 36–45.
19 (2). Anterior tarsal joint 1 of ♂ elongate, as long as 2-5 united; antennæ very elongate and serrate in ♂, much shorter and subfiliform in ♀; head, and sometimes the prothorax also, rufescent; elytra usually with a transparent streak or fascia: species small, narrow. Species 46–48.
20 (1). Antennal joint 1 of ♂ greatly thickened, the other joints filiform: species black and shining. Species 49, 50.

1. *Carphurus plicaticollis.*

Carphurus plicaticollis and vars. *curdaiensis*, *notaticollis*, and *rufithorax*, Pic, Mélanges exot.-entom. xxvii. p. 7 (1918).

♂. Eyes extremely large, oval; antennæ dilated, moderately long, sharply serrate; head with two or four transversely placed foveæ between the eyes and longitudinally bisulcate in front of this; anterior tarsal joint 1 small, nigro-pectinate beneath.

♀. Antennæ usually a little less dilated; head flattened between the eyes.

Length 4⅗–7 mm. (♂ ♀.)

Hab. New Guinea (*types of Pic*; *Sayer*, 1887, *ex coll. Sharp*), Dorey, and Waigiou (*Wallace*); Moluccas &c., Batchian, Gilolo [Halmaheira], Tenimber, Ké Is. (*Wallace*, *Doherty*).

There are numerous examples of this variable insect in the Hope Museum at Oxford and the British Museum in London, nearly all captured by Wallace or Doherty, including five ♂♂ and one ♀ of the var. *rufithorax*, Pic. It usually has the head, and the prothorax in some specimens, red, the elytra black, sometimes with a faint violaceous tint, and the abdomen wholly or in part black. The prothorax is oblong-subquadrate and transversely plicate, and the elytra are closely, rugulosely punctured. The Australian *C. vigilans* and *C. strigicollis*, Lea, have a similarly sculptured prothorax.

2. *Carphurus rastratus*, sp. n. (Pl. I. fig. 8, ♂.)

? *Carphurus cyaneipennis*, Macl. Proc. Linn. Soc. N.S.W. (2) i. p. 153 (1886) (nec *C. cyaneipennis*, Macl. Trans. Ent. Soc. N.S.W. ii. p. 263, 1872).

♂. Elongate, rather dull, finely pubescent, the legs hairy; rufo-testaceous, the antennæ (except at the base and tip), eyes, under surface, and legs (the testaceous knees, tarsi, and apices of the tibiæ excepted) black, the elytra cyaneous or fusco-cyaneous, the abdomen testaceous; the head and elytra densely, rugulosely, the abdomen feebly punctured, the prothorax closely, transversely strigose. Head very large, as seen from above with an irregular ✕-shaped elevation between the eyes, followed by two deep confluent central foveæ and preceded by an angular, bi-impressed excavation; eyes extremely large; antennæ moderately long, stout, sharply serrate. Prothorax as long as broad, subquadrate, without definite excavations. Elytra widened posteriorly, about as

long as the five exposed segments, rounded at the tip. Anterior tarsal joint 1 small, nigro-pectinate beneath.

♀. Head without foveæ, the eyes smaller; antennæ less dilated; abdomen black at the tip.

Length 5½–6 mm.

Hab. Moluccas, Banda [♂, type] and Ceram [♀] (*Wallace, in Mus. Oxon.*); New Guinea (*Sayer, ex coll. Sharp*: ♀).

One ♂, two ♀ ♀, the latter apparently belonging to the same species. This is a close ally of *C. plicaticollis*, Pic, differing from it in the metallic elytra and the structure of the head in the ♂, the latter (as seen from behind) having a deep central transverse fovea behind the frontal excavations. *C. cyaneipennis*, Macl. (1886), from New Guinea, may have been based upon the present species, and *C. rubriventris*, Motsch., "Ind. or.," seems to be an allied form.

3. *Carphurus celebensis*, sp. n.

♀. Very elongate, shining, pubescent, with longer hairs intermixed; black, the head and prothorax with a greenish lustre, the anterior margin of head and a small spot between the eyes, palpi, the five basal joints of antennæ in great part, anterior tarsi, and the abdominal segments 4–6 (except 4 at base) testaceous or rufo-testaceous, the elytra violaceous; the head and elytra closely punctured, the prothorax transversely strigose on the disc and rugose at the sides. Head about as wide as the prothorax; antennæ rather slender, sharply serrate. Prothorax transverse, subquadrate, transversely grooved before the base. Elytra elongate, subparallel, leaving five segments exposed. Anterior tarsal joint 1 small, without comb.

Length 6 mm.

Hab. Celebes, Tondano (*Wallace, in Mus. Oxon.*).

One ♀. A form of *C. ruficeps*, Pic, with a smoother blackish head, a less rugose prothorax, and slightly longer, parallel-sided, rougher elytra. *C. rufonotaticeps*, Pic (1917), from the same island, wants the transverse plication of the prothorax and has the prothorax itself elongate.

4. *Carphurus wallacei*, sp. n.

♀. Very elongate, moderately shining, pubescent, with longer hairs intermixed; head, antennal joints 1 and 2, palpi, prothorax, abdomen in great part, and anterior legs (the femora and coxæ in part excepted) testaceous, the rest of the antennæ, legs, and under surface black, the elytra

cyaneous; the head and prothorax closely, finely, the elytra rather strongly and rugosely, punctured, the prothorax finely transversely strigose on the disc. Head about as wide as the prothorax, bi-impressed anteriorly, the eyes rather large; antennæ moderately long, serrate. Prothorax strongly transverse, narrowed posteriorly. Elytra much broader than the prothorax, widened posteriorly, leaving five segments exposed. Anterior tarsal joint 1 small, about as long as 2 and 3 united, without comb.

Length $5\frac{1}{4}$ mm.

Hab. New Guinea (*Wallace, in Mus. Oxon.*).

One ♀, exact locality not recorded.

A close ally of *C. rastratus* (?=*cyaneipennis*, Macl., 1886), with a small, strongly transverse prothorax, more rugose, hairy elytra, and much smaller eyes.

5. *Carphurus ruficeps.*

Carphurus ruficeps, Pic, L'Echange, xxii. p. 57 (1906).

♂. Antennæ stout, moderately long, serrate; head large, transversely grooved between the eyes, the latter very large; anterior tarsal joint 1 about as long as 2 and 3 united, nigro-pectinate beneath.

♀. Antennæ less dilated; eyes a little smaller, the transverse groove between them shallow or obsolete.

Var. Head (except at the base) rufous; the prothorax nigro-cyaneous, the elytra violaceous or fusco-violaceous, and often semitransparent; the abdomen testaceous, with the basal segments and the terminal one violaceous or black, rarely almost entirely testaceous; antennæ (except at the base) and legs (the knees and tarsi in part excepted) black; the elytra a little longer, subparallel, broader and less rounded at the tip, and densely, rugulosely punctured.

Length $4\frac{1}{2}$–$6\frac{1}{2}$ mm. (♂ ♀.)

Hab. Moluccas &c., Amboyna [*type of Pic*], Ceram, Batchian, Buru, Timor, Morty, Sula (*Wallace and Doherty, in Mus. Brit. and Mus. Oxon.*).

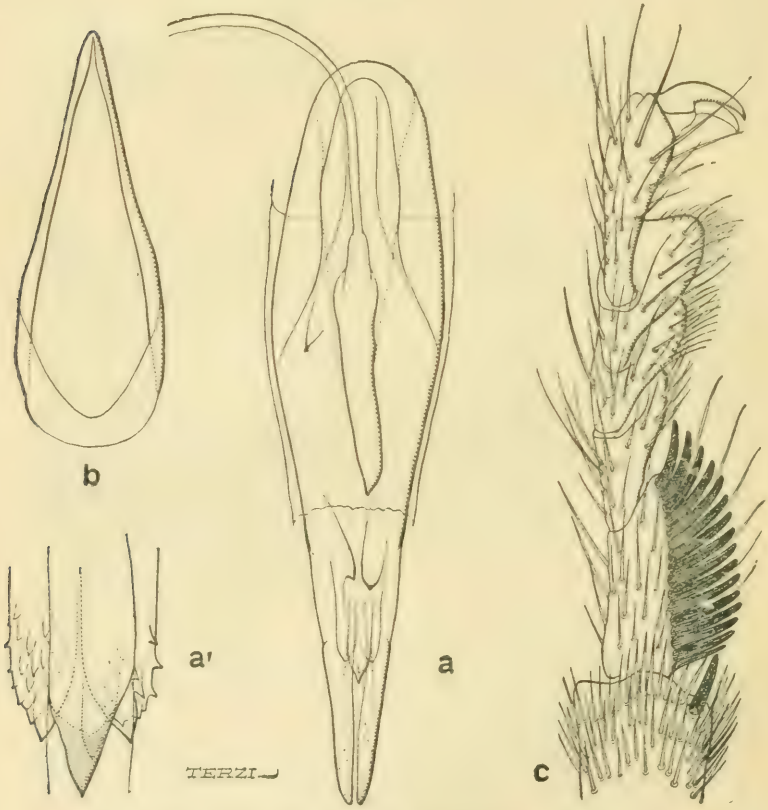
The typical form of this species has a red, rugosely punctured head, a transversely subquadrate, plicate, metallic prothorax, and very finely punctured, whitish elytra (a triangular dark scutellar patch excepted), the abdomen in great part testaceous, and the legs (the anterior tarsi excepted) black. Of this form there are several examples before me from Amboyna and Ceram, including a pair captured by Doherty. The eight specimens seen from the other islands are all ♀ ♀, and they must be treated as a variety of

C. ruficeps for the present. These latter can be separated from the variable *C. plicaticollis*, Pic, by the subquadrate, shorter prothorax, the relatively smaller eyes, and the different structure of the head in the ♂.

6. *Carphurus pengaronæ*, sp. n.

♂. Moderately elongate, widened posteriorly, shining, somewhat thickly pubescent, with longer hairs intermixed;

Fig. 1.



Carphurus pengaronæ, ♂ : *a*, *a'*, genitalia ; *b*, spiculum ? ; *c*, anterior tarsus and apex of tibia.

black with a bluish lustre in certain lights, the antennal joints 1 and 2, palpi, and abdominal segments 5 and 6 testaceous or rufescent ; the head closely, finely, the sides of

the prothorax and the elytra densely rugulosely punctured, the prothorax transversely strigose on the disc. Head about as wide as the prothorax, feebly foveate in the centre between the eyes, the latter moderately large; antennæ long, broad, strongly serrate. Prothorax transverse, subquadrate. Elytra moderately long, much wider than the prothorax, widening to the apex, the latter rounded, leaving four or five segments exposed. Anterior tibiæ with a single black dentiform seta at the apex beneath; anterior tarsal joint 1 rather stout, nearly as long as joints 2–4 united, nigro-pectinate along the lower edge, the comb furnished with 16 teeth (text-fig. 1, *c*).

♀. Antennæ shorter and less dilated.

Length 4–4½ mm. (♂ ♀.)

Hab. Borneo, Pengaron (*Doherty*: ♂ ♀); Gt. Sanguir, Taruna (*Doherty*: ♀).

Eight ♂ ♂ and three ♀ ♀ from Pengaron, one ♀ from Taruna. A dark form of *C. sumatrensis*, Pic, which was also found in the same locality by Doherty, with a less rugose head, longer, broader, and stouter antennæ in ♂, a transversely strigose, laterally rugose prothorax, and densely, more finely punctured elytra. The genitalia and tarsal comb of ♂ are shown on text-fig. 1, *a–c*.

7. *Carphurus sayeri*, sp. n.

♂. Very elongate, robust, shining, clothed with fine scattered pubescence intermixed with numerous long, erect, blackish hairs, the femora and tibiæ also hairy: brilliant nigro-cyaneous, the elytra violaceous, the antennæ (the testaceous lower surfaces of the basal joints excepted) and legs black; the head and prothorax almost smooth, the elytra closely punctured. Head short, narrower than the prothorax, transversely depressed between the eyes, the latter rather small; antennæ moderately elongate, comparatively stout, joints 6–11 much longer than those preceding, 6–10 elongate-triangular. Prothorax nearly as long as broad, moderately convex, transversely grooved before the base. Elytra broader than, and nearly three times the length of, the prothorax, widening posteriorly, broadly depressed along the suture below the base, rounded at the apex, leaving about four segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, rather stout, furnished with a row of long black teeth along the lower edge.

Length 4½ mm.

Hab. New Guinea (*Sayer Expedition, ex coll. Sharp*).

One ♂. A brilliantly metallic, robust, nigro-hirsute insect, with a comparatively small, short head and a polished basally-excavate prothorax. An isolated form, with the general facies of a Galerucid.

8. *Carphurus laratensis*, sp. n. (Pl. I. figs. 7, 7 *a*, ♂.)

♂. Very elongate, robust, shining, sparsely pubescent and also clothed with long, erect or projecting, darker bristly hairs; testaceous, or reddish testaceous, the eyes excepted; the basal portion of the head closely, the elytra coarsely, rugosely, and the prothorax and abdomen very sparsely, finely, punctured. Head about as wide as the prothorax, hollowed and bicarinate in the middle between the eyes, and with four large, deep, transversely placed foveæ extending across the depressed postocular space; eyes moderately large. Antennæ stout, long, serrate. Prothorax longer than broad, bi-impressed laterally. Elytra wider than the prothorax, long, flattened on the disc, oblongo-quadrate, truncate at the tip, leaving five abdominal segments exposed; the outer margins triangularly dilated below the humeri and hollowed at the middle. Anterior tarsal joint 1 short, nigro-pectinate along the entire lower edge.

♀. Head flattened, longitudinally bi-impressed between the eyes, sparsely punctured; elytral margins feebly sinuate.

Length 7–9 mm. (♂ ♀.)

Hab. Larat (*F. Muir*: ♂ ♀); Tenimber, Jandema (*Doherty*: ♂ ♀).

Six ♂ ♂, seven ♀ ♀, the specimens from the two islands agreeing perfectly *inter se*. A large, robust, testaceous form, with coarsely punctured, flattened, oblongo-quadrate elytra, and stout serrate antennæ in the two sexes; the ♂ with an excavate, bicarinate, transversely 4-foveate head and the lower margin of the elytra angulate below the base. *C. laratensis* belongs to Lea's Group A (Revision, 1909); the ♂ elytra are shaped as in his *C. uncinatus*.

9. *Carphurus testaceicolor*.

♀. *Balanophorus testaceicolor*, Pic, Mélanges exot.-entom. xxv. p. 11 (1907)?

"Elongatus, nitidus, testaceus, oculis et antennis pro majore parte nigris. Long. 9 mm." [*Pic.*]

♂. Very elongate, rather narrow, shining, sparsely pubescent, with longer hairs intermixed; testaceous, the eyes and the antennal joints 2–7 or 2–8 black; the head sparsely punctured, the elytra subcoriaceous and very finely

punctulate, the rest of the surface almost smooth. Head longitudinally bisulcate between the eyes, the latter extremely large; antennæ very elongate, stout, sharply serrate. Prothorax longer than broad, bi-impressed laterally. Elytra broader than the prothorax, as long as the five exposed abdominal segments, rounded at the tip. Anterior tarsal joint 1 as long as 2–4 united, nigro-pectinate along the entire lower edge.

♀. Head as in ♂, the eyes much smaller; antennæ equally elongate, but more slender, tapering towards the tip; anterior tarsi without comb.

Length 6½–7½ mm.

Hab. New Guinea, Andai [*type of Pic*], and Mysol (*Wallace*: *Mus. Brit. and Mus. Oxon.*).

Two ♂ ♂ and three ♀ ♀ in the collections before me, including a ♀ from New Guinea, are perhaps referable to this species, which is diagnosed by the author in ten words and compared with his *B. apicalis*. These specimens have very elongate, serrate antennæ and extremely finely punctured elytra. The ♀ resembles the same sex of the Australian *C. longus*, Lea (a ♀ of which from Kuranda, Queensland, is before me); the latter, however, has slender antennæ, smaller eyes, and more strongly punctured elytra.

10. *Carphurus pallidulus*, sp. n.

♀. Elongate, narrow, shining, finely pubescent, with longer hairs intermixed; testaceous, the eyes, tips of mandibles, and antennæ (except at the base) black or piceous; the upper suface very sparsely, the elytra closely, minutely, punctured. Head much broader than the prothorax, bi-impressed in front, the eyes extremely large and convex; antennæ moderately long, rather slender, joint 2 about as long as 3, 4–10 triangular, 6–10 slightly longer than broad. Prothorax convex, narrow, as long as broad, deeply transversely depressed before the base and with an oblong sulciform excavation on each side anteriorly. Elytra much wider than the prothorax, comparatively short, depressed, dehiscent at the sutural angle, bluntly rounded at the apex, leaving six abdominal segments exposed. Anterior tarsi slender, joint 1 narrow, as long as 2 and 3 united.

Length 5 mm.

Hab. Batchian, Labuan [Laboean] (*Doherty*).

One ♀, somewhat immature. Not unlike *C. batchianus* (No. 30) (found by Doherty in the same island), and with the head, eyes, and prothorax similarly shaped; the body

and legs wholly testaceous; the antennæ totally different in form; the elytra shorter, more rounded at the tip, and minutely, less rugulosely punctate. The two insects cannot possibly be the sexes of the same species. *C.* (*Balanophorus*) *testaceicolor*, Pic, from New Guinea and Mysol, is a much larger form, with very elongate, sharply serrate antennæ in both sexes.

11. *Carphurus fasciatifrons*, sp. n.

♀. Very elongate, robust, shining; the elytra and abdomen closely cinereo-pubescent, the head and prothorax sparsely pubescent and with longer scattered hairs intermixed, the legs and abdomen also with long erect or projecting hairs; the head (a transverse black inter-ocular fascia and a piceous spot in front of it, and the eyes excepted), palpi, basal joints of the antennæ beneath, prothorax, scutellum, anterior coxæ, and bases of all the femora, testaceous or flavous, the elytra obscure nigro-cæruleous, the abdomen, under surface, the rest of the antennæ, and the legs in part, nigro-piceous; the head and prothorax very sparsely, minutely, the elytra densely, rugulosely, and the abdomen closely and extremely finely, subrugulosely punctate. Head broad, the inter-ocular space slightly depressed and with a small tubercle in the middle, the eyes very large; antennæ long, serrate. Prothorax subcordate, about as broad as long, transversely depressed before the base and on each side anteriorly. Elytra $2\frac{1}{2}$ times the length of the prothorax, elongato-quadrate, flattened on the disc, widening posteriorly, and truncate at the tip, leaving five abdominal segments exposed. Anterior tarsal joint 1 nearly as long as 2–4 united, without comb.

Length 9 mm.

Hab. Mysol (*Wallace, in Mus. Oxon.*).

One ♀. A large, robust, elongate form, with a broad, nigro-fasciate head, a trifoveate, cordiform prothorax, long, parallel-sided, bluish-black, rugose elytra, rugulose abdomen, and a long basal joint to the anterior tarsi, these characters separating *C. fasciatifrons* from all the Malayan species known to me.

12. *Carphurus dohertyi*.

? *Balanophorus dohertyi*, Pic, Mélanges exot.-entom. xxv. p. 10 (♂) (1917).

♀. Elongate, shining, black, finely pubescent, with intermixed long, erect, black hairs, the legs also hairy; black,

the head (except at the base), antennæ (except at the base and apex), abdomen in great part, knees, and tarsi testaceous or rufo-testaceous. Head large, sparsely, very finely punctured, transversely strigose at the base, bi-impressed in front; eyes extremely large, oval; antennæ sharply dentate, stout. Prothorax about as long as broad, sparsely, coarsely punctate, transversely depressed before the base and on each side anteriorly. Elytra broader than the prothorax, widened posteriorly, rather elongate, bluntly rounded at the tip; closely, rugulosely punctured. Anterior tarsal joint 1 short, without trace of comb.

Length 7½–8 mm.

Hab. Moluccas &c., Obi (*Doherty*: *type of Pic*, ♂), Dodinga, Gilolo [Halmaheira] (*Doherty*: ♀).

A very large shining black form, with the head and abdomen in part red, not unlike *C. plicaticollis*, Pic, but with a sparsely punctured, non-plicate prothorax, the antennæ flabellate and the head sulcate in ♂. The two females from Gilolo must belong to the same species. If the genus *Balanophorus* is to be restricted to forms with a tarsal comb in both sexes, as has been adopted by Lea in 1921, the present species must be included under *Carphurus*.

13. *Carphurus dentaticornis*, n. n.

? *Balanophorus apicalis*, Pic, Mélanges exot.-entom. xxv. p. 11 (♀) (1917) (nec *C. apicalis*, Macl., 1872).

"Elongatus, nitidus, pallido testaceus, oculis, antennis pro majore parte, tarsis abdomineque pro majore parte nigris, elytris nigris, ad basin testaceis; antennis crassis, dentatis. Long. 8 mm." [*Pic.*]

Var. Elytra almost entirely and posterior tibiæ infuscate or black, the abdomen (except at tip) testaceous.

Hab. New Guinea, Andai [*type of Pic*], Dorey, and Waigiou (*Wallace, in Mus. Oxon.*); Moluccas, Buru (*Doherty*).

Three ♀ ♀, length 7½–10 mm., found by Wallace and Doherty, are probably referable to the imperfectly-described *C. apicalis*, Pic (nec Macl.), which is said to differ from *C.* (*Balanophorus*) *macassarensis*, Pic (loc. cit.), type ♀, from Macassar, in having the abdomen red at the tip and the elytra longer. The specimens before me are very like *Brachyhedybius sinuatus*, Pic, ♀; but they have much larger eyes, sharply dentate antennæ, with the basal joints and tip testaceous, and more elongate, closely punctured elytra. *B. macassarensis* has subflabellate antennæ in ♀. The anterior tarsi are without comb. The variety is represented by a ♀ from Buru.

14. *Carphurus rubroannulatus.*

Carphurus rubroannulatus, Motsch. Etudes Ent. viii. p. 64 (1859) [1].
Carphurus variiventris, Fairm. Ann. Soc. Ent. Fr. 1888, p. 353 [2]; Bourg. *op. cit.* 1890, 175 [3] *.
Carphurus atromaculatus, Pic, Mélanges exot.-entom. xxvii. p. 6 (1918) [4].
Carphurus atromaculatus, v. *diversipennis*, Pic, Mélanges exot.-entom. xxxiii. p. 19 (1921) [5].
? *Carphurus tonkineus*, Pic, Bull. Mus. Paris, xxviii. p. 52 (1922) [6].

♂. Anterior tarsal joint 1 small, nigro-pectinate beneath; head bi-impressed between the eyes, as in ♀.

Var. α.—The dorsal abdominal segments 1–4 and 5 at the base nigro-fasciate, the scutellum, the elytra at the sides or almost entirely, and the rest of the abdomen testaceous. (♂.)

Var. β.—All the abdominal segments nigro-fasciate or black. (♀.)

Length 5–7½ mm. (♂ ♀.)

Hab. "India" (*Mus. Brit.*); Ceylon [1]; Tenasserim; Cochin China [3]; Siam; Penang; Singapore; Mt. Ophir; Java [3]; Borneo, Sarawak, Pengaron, Quop; Laos, Luang Prabang (*Salvaza*: var. *β*); Tonkin [2 3 6]; Philippines (*Semper*), Dapitan (*C. F. Baker*: No. 17052), Palawan; Sumatra [5]; Moluccas, Ceram [var. *α*] and Buru (*Wallace, in Mus. Oxon.*), Ilat, Buru (*Doherty*).

The numerous specimens of this widely distributed Malayan insect in the Museums of London and Oxford, including many captured by Wallace, agree with the descriptions of Motschulsky [1], Fairmaire [2], and Pic [4], and the *C. tonkineus* of the last-named author may belong to the same species, though it would appear to have more slender antennæ. The typical form has the head, prothorax, palpi, basal joints of antennæ, anterior legs, and the two or three terminal abdominal segments testaceous, the elytra, under surface, four hinder legs, and the rest of the antennæ black, and the four basal segments of the abdomen nigro-fasciate, with the sides and apical margins testaceous; the antennæ rather stout, serrate, and very similar (as is the head) in the two sexes; the eyes rather small; the prothorax long, smooth, transversely bi-impressed on each side; the elytra about as long as the exposed five abdominal segments, in some specimens with a faint bluish or violaceous lustre. The similarly-coloured *C. vigilans*, Lea (1909), from Queensland, has a transversely strigose prothorax.

* Incorrectly quoted under the specific name *variitarsis* by Bourgeois.

15. *Carphurus basilanus*, sp. n.

♂. Very elongate, rather convex, narrow, shining, thickly clothed with long erect hairs; testaceous, the eyes, the outer half of the antennæ, elytra (except at the shoulders beneath), metasternum, the two basal dorsal abdominal segments (except along their apical margins), and the bases of the posterior femora, nigro-piceous or black; sparsely, minutely, the elytra more strongly, punctured. Head about as wide as the prothorax, longitudinally bisulcate between the eyes; antennæ very long, stout, serrate. Prothorax longer than broad, transversely sulcate before the base and also at the sides anteriorly. Elytra elongate, parallel, equalling the five exposed segments in length. Anterior tarsal joint 1 about as long as 2 and 3 united, nigro-pectinate beneath.

Length 5 mm.

Hab. Philippines, Basilan Isl. (*C. F. Baker*: No. 17049).

One ♂. A close ally of the variable *C. rubroannulatus*, Motsch., differing from that insect in its much narrower shape, parallel elytra, and testaceous legs, the posterior femora infuscate at the base only. The antennæ are much stouter and the elytra longer and narrower than in *C. dispar*, Er.

16. *Carphurus bivittatus*, sp. n.

♂. Very elongate, robust, shining, finely pubescent, with scattered long hairs intermixed; rufo-testaceous, the eyes, scutellum, elytra (the flavous sutural and lateral margins excepted), metasternum, and abdomen (the three terminal segments and the margins of the others excepted) nigro-piceous or black, the front of the head and the basal margin of the prothorax pale yellow; the elytra densely, rugulosely, the head and prothorax very sparsely, finely, punctate. Head rather short, not so wide as the prothorax, obliquely carinate and impressed on each side between the eyes, the latter not very large; antennæ stout, moderately long, serrate. Prothorax broader than long, subcordate, transversely depressed before the base. Elytra about $2\frac{1}{2}$ times the length of the prothorax, subtruncate at the tip, leaving five abdominal segments exposed. Legs rather stout, anterior tarsal joint 1 widened, nearly as long as 2–4 united, extended over 2, nigro-pectinate along the lower edge.

Length $7\frac{1}{2}$ mm.

Hab. Moluccas, Buru (*Wallace, in Mus. Oxon.*).

One ♂. A very elongate, robust, rufo-testaceous form, with the elytra (the flavous sutural and lateral margins excepted), metasternum, and basal half of the abdomen black, the head and prothorax rather short, the antennæ stout, and the basal joint of the anterior tarsi thickened and extending over 2 above. The prothorax is transversely cordate, much as in *C. fasciatifrons*.

17. *Carphurus muiri*, sp. n.
(Pl. I. fig. 16, elytra in profile.)

♂. Very elongate, narrow, shining, clothed with fine pubescence intermixed with very long, erect, blackish hairs, the legs also with long bristly hairs; testaceous, the eyes and elytra (except along the suture in some specimens) black; the elytra closely, rather strongly punctate, the rest of the upper surface almost smooth. Head (including the somewhat prominent eyes) slightly wider than the prothorax, with a trapezoidal, bisulcate interocular depression, limited posteriorly by a ∨-shaped ridge, behind which there is a pencil of erect hairs in the middle and a deep triangular cavity on each side; antennæ moderately long, stout, serrate. Prothorax as long as broad, convex, deeply transversely depressed before the base, and also hollowed on each side anteriorly. Elytra wider than the prothorax, elongato-subquadrate, armed with a stout, oblique, hook-like tooth at the sides below the humeri, subtruncate at the apex, leaving five abdominal segments exposed. Anterior tarsal joint 1 narrow, rather short, nigro-pectinate along the lower edge.

♀. Head hollowed and bisulcate between the eyes; antennal joints 9–11 and the intermediate and posterior femora black in one specimen; elytra feebly sinuate along the lower margin.

Length 4–4½ mm. (♂ ♀.)

Hab. Larat (*F. Muir*: ♂ ♀); Tenimber, Jandema (*Doherty*: ♂); Letti I. [type] (*Doherty*: ♂).

Five ♂ ♂, two ♀ ♀, the legs and antennæ varying in colour in the latter. Differs from *C. cinctipennis*, Pic, from Timor &c., in the stronger elytral puncturing, the ♂ with a fasciculate head, wholly testaceous antennæ, and a longer hook-like tooth at the sides of the elytra. *C. muiri* is related to the Australian *C. fasciculatus*, Lea.

18. *Carphurus cinctipennis.*

♀. *Carphurus cinctipennis*, Pic, Mélanges exot.-entom. xxvii. p. 7 (1918).

♂. Head depressed anteriorly, and with two smooth deep foveæ between the eyes, the foveæ preceded by an angulate transverse ridge and limited externally by a curved tuberculiform prominence; antennæ long, stout, serrate; elytra triangularly dilated at the sides below the humeri; anterior tarsal joint 1 short, nigro-pectinate beneath.

♀. Head simply bi-impressed; elytral margins feebly sinuate.

Length $3\frac{1}{2}$–$5\frac{1}{2}$ mm. (♂ ♀.)

Hab. Timor [*type of Pic*], Mt. Leo, Dilli (*Doherty*); Flores (*Wallace, in Mus. Oxon.*), Endé (*Doherty*); Allor Is., Pura and Maru (*Doherty*).

A long and variable series of this species was captured by Doherty in Timor and other islands, mostly at elevations between 2000 and 4000 ft. A narrow, elongate, shining form, testaceous in colour, with the antennal joints 6–11, the base of the head to a variable extent, a narrow median vitta on the prothorax (often wanting, as in the type), the scutellum, the elytra on all sides (usually leaving a common broad elongate pallid space on the disc and the scutellar region infuscate), and a transverse fascia on the abdominal segments 4 and 5, black. The prothorax is long, almost smooth, bi-impressed on each side. The elytra are oblong-subquadrate, closely punctured, and in the ♂ triangularly dilated at the sides below the humeri. *C. cinctipennis* belongs to Lea's group A, near his *C. uncinatus*. An allied unnamed form before me, from the Adelaide River, N.W. Australia, comes very near it.

19. *Carphurus dispar.*

Carphurus dispar, Er. Entomographien, p. 133 (♂, nec ♀) (1840).

Hab. Bintam I., Gulf of Singapore (*type of Erichson*); Singapore (*Baker*); Penang (*ex coll. Pascoe, in Mus. Brit.*).

It is highly probable that the black ♀ referred to *C. dispar*, the ♂ of which is described as having the head, prothorax, and legs testaceous, belongs to a different species. Specimens of a *Carphurus* from Penang and Singapore, presumably ♀ ♀ (as the tarsal comb is absent), may be conspecific with Erichson's ♂, from the description of which they differ in having the scutellum testaceous and the posterior legs partly

infuscate, characters of no importance. They have very elongate, rather stout, sharply serrate antennæ; the head large, transversely impressed between the eyes; the prothorax elongate, smooth, deeply transversely sulcate at the base and also at the sides anteriorly; the elytra black, nearly as long as the exposed five abdominal segments, extremely finely punctate.

20. *Carphurus amboynensis*, sp. n.

♂. Very elongate, narrow, shining, sparsely, finely pubescent, with intermixed longer hairs: black, the head (except at the base), the antennal joints 1–4, prothorax, and the tibiæ and tarsi in part or entirely, testaceous; the head closely, the prothorax sparsely, the elytra very finely punctured. Head broad, trifoveate between the eyes, the latter large and prominent; antennæ long, rather stout, sharply serrate. Prothorax longer than broad, rather narrow, transversely sulcate before the base and also at the sides anteriorly. Elytra long, parallel, equalling the exposed five segments in length. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate beneath.

Length 4 mm.

Hab. Amboyna (*Wallace, in Mus. Oxon.*).

One ♂. The more closely punctured, basally-infuscate head, the prominent larger eyes, and the wholly infuscate femora separate this species from the insect here identified as *C. dispar*, Er.

21. *Carphurus dilutus*, sp. n.

♂. Elongate, shining, pilose; head (eyes excepted), antennal joints 1 and 2, prothorax, and abdomen wholly or in great part, testaceous or rufo-testaceous, the rest of the antennæ, metasternum, and legs (the testaceous anterior knees and tarsi excepted) nigro-piceous or black; the elytra dilute piceous or brownish, with the humeri or sides flavescent, the pallid coloration in one example extending over the entire surface, a common triangular scutellar patch excepted; the head and prothorax very sparsely, the elytra closely, punctate. Head broad, feebly trifoveate anteriorly, the eyes large; antennæ stout, moderately long, obliquely serrate, joints 4–10 broader than long. Prothorax transverse, convex, rounded at the sides, narrowed behind, transversely grooved before the base. Elytra soft, much broader than the prothorax, widened posteriorly, moderately long, rounded at the tip, leaving four or five abdominal segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the entire lower edge.

Length $3\frac{1}{2}$–$4\frac{1}{4}$ mm.

Hab. Philippines (*Semper, in Mus. Brit.*), Island of Basilan (*Baker*: Nos. 17048, 17050, 17051), Los Baños, Mindanao, and Palawan (*Baker*).

Described from four ♂♂ and two ♀♀. This is a Philippine form of *C. transparipennis*, Motsch., and *C. malaccanus*, Pic, differing from both of them in the stouter and more obliquely serrate antennæ in the ♂, and in the red head and prothorax. The dilute coloration of the elytra is common to *C. ruficeps* and *C. sumatrensis*, Pic, and other species of the genus, *C. sumatrensis* having a very rugose head and a less convex prothorax.

22. *Carphurus sumatrensis.*

Carphurus sumatrensis, Pic, L'Echange, xxii. p. 57 (1906).

♂. Head as wide as the prothorax, almost unimpressed; antennæ stout, strongly obliquely serrate; anterior tarsal joint 1 nearly as long as 2–4 united, nigro-pectinate along the lower edge, 2 and 3 short, slender.

♀. Antennæ less widened.

Length 4–5 mm.

Hab. Tenasserim; Siam; Perak; Mt. Ophir (*Wallace*); Penang; Borneo, Sandakan, Pengaron, and Sarawak; Sumatra (*type of Pic*); Philippines, Basilan and Palawan (*Baker*).

There are twenty of this species in the British Museum and one from Mt. Ophir at Oxford. A moderately elongate, nigro-cæruleous insect, with the anterior portion of the head, palpi, basal joints of the antennæ, anterior tarsi, and abdomen in great part or entirely, rufescent or rufo-testaceous; the prothorax transverse, not very convex, deeply transversely grooved before the base; the elytra (in the type) with a transparent flavescent lateral stripe extending from the base to near the apex, which is often obsolete; the head densely, rugosely, the prothorax sparsely, finely, and the elytra closely, punctured. *C. rubroannulatus*, Motsch., has a similar extended distribution in the Malayan region.

23. *Carphurus philippinus*, sp. n.

♂. Elongate, shining, pilose; nigro-cæruleous, the head to a variable extent in front, palpi, basal joints of antennæ, anterior tarsi, and abdomen (except at the base and tip) testaceous or rufo-testaceous, the rest of the antennæ and legs black; the elytra sometimes in part brownish or semi-transparent (leaving a triangular scutellar patch and the apex metallic), or with a transverse or oblong yellowish patch on

the disc; the head (except at base) and prothorax rather sparsely, the elytra very closely, finely punctured. Head short, a little wider than the prothorax, the eyes large; antennæ stout, obliquely serrate, joints 4–10 broader than long. Prothorax transverse, rounded at the sides, moderately convex, transversely grooved before the base and also on each side anteriorly, in some specimens more roughly punctured and feebly transversely strigose towards the sides. Elytra widened posteriorly, moderately elongate, leaving four or five abdominal segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the lower edge.

Vars. The head (except at base) and antennal joints 1, 2, and 11 rufo-testaceous (♀), or the abdomen in great part infuscate (♂).

Length 3–4½ mm.

Hab. Philippines, Mindanao (*Baker, Semper*: ♂ ♀), N. Luzon (*Whitehead*: ♂), Mt. Makiling [type] and Los Baños (*Baker*: ♂ ♀), Palawan and Basilan (*Baker*).

An extremely variable insect, if the numerous ♀ ♀ sent me by Mr. Baker all belong to the same species, differing from the widely-distributed *C. sumatrensis*, Pic, in their smoother head, the testaceous space on the elytra (when present) not in the form of a lateral stripe. The metallic coloration, &c., separate *C. philippinus* from *C. malaccanus*, Pic, and *C. transparipennis*, Motsch.

24. *Carphurus transparipennis.*

? *Carphurus transparipennis*, Motsch. Etudes ent. iii. p. 45 (1854) (♀).
? *Carphurus bipartitus*, Pic, Mélanges exot.-entom. xxxiii. p. 19 (May 1921).

♂. Elongate, rather broad, shining, pilose; black or piceous, the basal four or five joints of the antennæ and the anterior legs in part testaceous, the elytra whitish and semi-transparent from a little below the base to near the apex, the pallid coloration sometimes extending over their entire surface, the prothorax and abdomen obscurely rufescent in immature examples. Head broad, finely punctured, bi-impressed between the eyes, the latter rather large; antennæ serrate, not very long, stout, joints 7–10 transverse. Prothorax transverse, broad, convex, flattened laterally, rounded at the sides, closely, finely punctured, smoother along the median line, transversely grooved before the base. Elytra soft, widened posteriorly, rather long, truncate at the apex, leaving four or five abdominal segments exposed; densely, very finely punctured. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the lower edge.

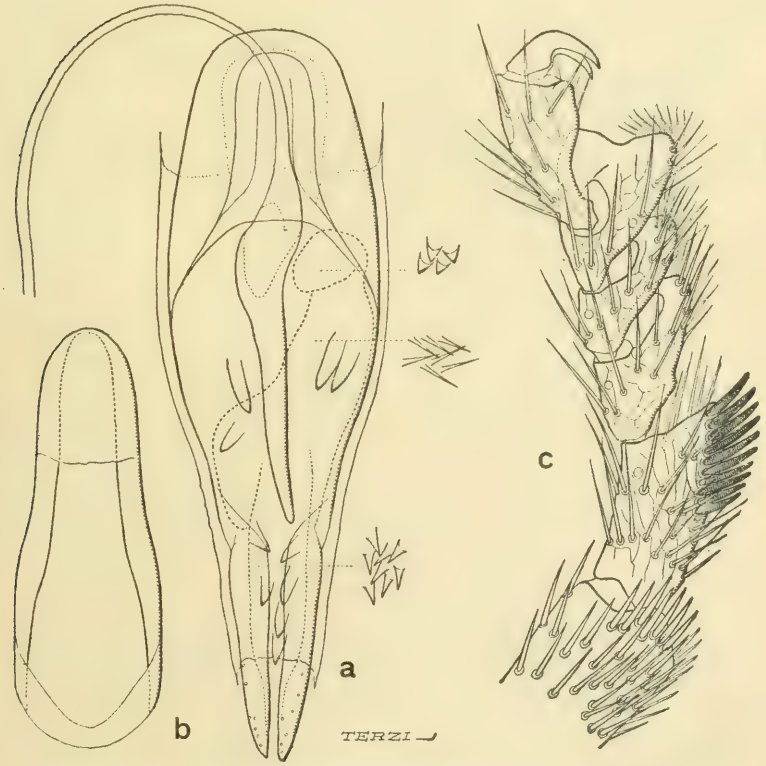
♀. Antennæ a little more slender.

Length 3–4 mm.

Hab. "Ind. or." (*Motschulsky*); Assam, Patkai Mts., Nagas, and Perak (*Doherty*); Borneo, Quop and Mt. Matang (*G. E. Bryant*); Malay Archipelago [locality wanting] (*Wallace, in Mus. Oxon.*); Sumatra (*type of Pic*).

Numerous examples. Motschulsky's brief description almost certainly refers to this insect, which seems to be a form of *C. malaccanus*, Pic, with the elytra in great part whitish and semitransparent, occurring at the same localities. *C. bipartitus*, Pic, has the elytra broadly whitish posteriorly, and the base and sides black. A broader and more robust ♀ from Tonglu, Sikkim, alt. 10,000 ft. (*Stevens*), comes very near the present species.

Fig. 2.

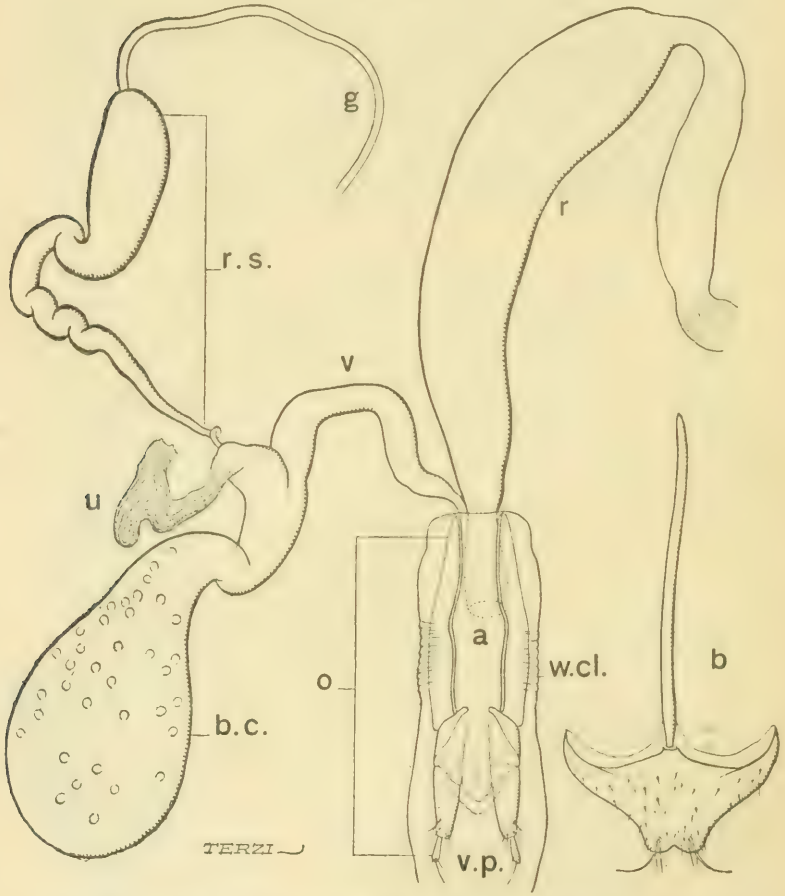


Carphurus basalis, ♂: *a*, genitalia; *b*, spiculum?; *c*, anterior tarsus and apex of tibia.

25. *Carphurus basalis*, sp. n.

♂. Elongate, narrow, shining, finely pubescent; black, the antennæ (the terminal 2–5 joints excepted), the base of

Fig. 3.



Carphurus basalis, ♀ : genitalia: *w.cl.*, wall of cloaca; *o.*, ovipositor; *v.p.*, vaginal palp; *a.*, anus; *r.*, rectum; *v.*, vagina; *r.s.*, receptaculum seminis; *g.*, gland; *u.*, uterus; *b.c.*, bursa copulatrix: *b*, 8th sternite and supporting strut.

the elytra broadly, the tibiæ, and tarsi testaceous; the entire upper surface very finely punctured, the prothorax smoother on the disc anteriorly and rugulose behind. Head (including

the prominent eyes) broader than the prothorax, trifoveate; antennæ long, a little thickened outwards, joints 5–10 elongate-triangular. Prothorax convex, about as long as broad, sinuously narrowed posteriorly, transversely depressed before the base. Elytra oblong-subquadrate, a little widened posteriorly, leaving four or five abdominal segments exposed. Terminal abdominal segment emarginate at tip. Legs slender; anterior tarsal joint 1 narrow, as long as joints 2 and 3 united, nigro-pectinate along the outer half beneath, the comb furnished with ten teeth (text-fig. 2, *c*).

♀. Antennæ a little more slender.

Length $2\frac{1}{2}$–$3\frac{1}{2}$ mm.

Hab. Ceylon (*Thwaites, in Mus. Oxon.*: ♂ ♀), Kandy (*G. E. Bryant*: vi. 1908: ♂ ♀).

A long series, the sexes in about equal numbers. A small, narrow, shining black form, with the antennæ (except two or more of the terminal joints), base of elytra, tibiæ, and tarsi clear testaceous; the ♂ with the black comb extending along the outer half of the basal joint of the anterior tarsi beneath. This structure and the genitalia of the two sexes are shown on text-figures 2 and 3. *C. nigritulus* (infra, No. 27) is probably a more widely distributed dark form of the same species, which requires a distinctive name. Neither of these insects can be identified from Motschulsky's papers on Ceylon insects.

26. *Carphurus malaccanus.*

? *Carphurus malaccanus*, Pic, Mélanges exot.-entom. xxv. p. 9 (1917).

♂ ♀. Very like *C. transparipennis*, Motsch., the elytra wholly piceous or black, the abdomen in some specimens rufescent to near the tip. Antennæ and anterior tarsi similarly formed.

Length 3–$3\frac{1}{2}$ mm.

Hab. Tenasserim; Perak [*type of Pic*]; Borneo, Pengaron (*Mus. Brit.*).

A long series of specimens from Tenasserim, and others from Perak and Pengaron, all found by Doherty, are referred to the imperfectly described *C. malaccanus*, Pic, the structure of the antennæ, tarsi, &c., not being mentioned. A ♂ from W. Almora, India (*H. G. C.*), with a smoother prothorax, may belong here. The type (♀) of *C. nigrinus*, Gorh., from Belgaum, is very like the same sex of *C. malaccanus*, differing from it in the more slender, subfiliform antennæ and the basally-narrowed prothorax.

27. *Carphurus nigritulus*, sp. n.

? *Carphurus nigrinus*, Gorh. Ann. Soc. Ent. Belg. xxxix. p. 321 (part.) (1895).

♂. Elongate, narrow, shining, finely pubescent; black or piceous, the four or five basal joints of the antennæ, and sometimes the tarsi also, testaceous, the head sometimes reddish in front; the upper surface very finely punctulate. Head (including the rather large, prominent eyes) wider than the prothorax, trifoveate anteriorly; antennæ long, not very slender, joints 6–10 longer than broad, subtriangular. Prothorax broader than long, sinuously narrowed behind, transversely depressed before the base and also on each side anteriorly, the disc in some specimens feebly transversely strigose. Elytra moderately long, a little widened posteriorly, depressed on the disc below the base, leaving five abdominal segments exposed. Terminal abdominal segment deeply emarginate and bidentate at tip. Anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the whole or part of the lower edge.

♀. Antennæ a little more slender.

Length $2\frac{1}{4}$–$3\frac{1}{2}$ mm.

Hab. India, Central Almora, Kumaon (*H. G. C.*: ♂), Belgaum (*H. E. Andrewes*: ♀); Assam and Momeit, Burma; Ceylon (*Thwaites*: ♂ ♀), Kandy (*G. E. Bryant*: ♂ ♀), Galle (*G. Lewis*: ♀).

The above description is taken from a long series from Ceylon and Assam. The Kandy specimens are taken as typical; those from Kumaon, Assam, and Burma are smaller, and have the antennæ more slender, thus coming near the type (♀) of *C. nigrinus*, Gorh. (No. 41), which has these organs subfiliform and joints 1 and 2 only testaceous. The Ceylon examples were found with *C. basalis*. The second Belgaum specimen (♀) referred to *C. nigrinus* by Gorham is piceous, with the head reddish. The tarsal comb varies in development in the Assam series, but in the numerous ♂ ♂ from Ceylon it is more extended than in any of the numerous specimens of *C. basalis* before me; in the single ♂ taken in Almora, which may belong to a different species, it is reduced to six teeth. The nearly allied *C. filicornis* (No. 40) has slender filiform antennæ in both sexes, and a very deep basal groove on the prothorax.

28. *Carphurus tondanus*, sp. n.

♀. Very elongate, narrow, shining, pilose; black, the head piceous, the antennal joints 1–4, and anterior tarsi in

part, testaceous, the elytra with a slight bluish lustre; the upper portion of the head and the prothorax sparsely finely, the elytra very closely and rather strongly, punctured. Head (including the small prominent eyes) a little broader than the prothorax, rather narrow, transversely excavate and rugosely punctate anteriorly; antennæ moderately long, rather slender, joints 6–10 sharply oblong-triangular. Prothorax convex, narrow, as long as broad, oblongo-cordate, deeply transversely grooved before the base, and also depressed on each side anteriorly. Elytra as long as the five exposed abdominal segments, narrowed anteriorly.

Length 5 mm.

Hab. N. Celebes, Tondano (*Wallace, in Mus. Oxon.*).

One ♀. A very elongate, narrow, black form, resembling *C. nigritulus*, from India, Ceylon, &c., but of stouter build, and with a longer, basally-excavate prothorax, submetallic, densely, subrugulosely punctured elytra, &c. *C. rufonotaticeps*, Pic (1917), from Toli-Toli, Celebes, which is compared with *C. plicaticollis* by its describer, is probably a broader insect; the incomplete diagnosis, however, agrees in some respects with the Tondano specimen before me.

29. *Carphurus dapitanus*, sp. n.

♂. Very elongate, narrow, shining, finely pubescent, with intermixed long hairs, which are conspicuous on the tibiæ and abdomen; black, the antennal joints 1–3 partly testaceous. Head a little wider than the prothorax, obliquely narrowed behind the eyes, the latter prominent, small, the interocular space strongly trifoveate; antennæ long, widened, sharply serrate from joint 4 onward, 5–10 longer than broad. Prothorax convex, as long as broad, almost smooth, deeply transversely grooved before the base and also excavate on each side anteriorly. Elytra much broader than the prothorax, widened posteriorly, elongate, longer than the five exposed abdominal segments, closely, finely punctured. Legs slender; anterior tarsal joint 1 thickened, as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Antennæ shorter.

Length 4¼ mm.

Hab. Philippines, Basilan I. [♀], Dapitan, Mindanao (*Baker*: No. 17053, type, ♂).

Three ♂ ♂, two ♀ ♀. A shining black form, not unlike *C. rouyeri*, Pic, with more elongate, closely punctured elytra, the ♂ with dilated acutely serrate antennæ and a much shorter basal joint to the anterior tarsi. The transversely sulcate

prothorax and the broader fourth tarsal joint distinguish the present species from *Carphuroides pectinatus*, *C. dentiger*, &c. The Australian *Helcogaster niger*, Lea, approaches the present species.

30. *Carphurus batchianus*, sp. n.

♀. Elongate, very shining, clothed with fine pubescence intermixed with long blackish hairs, the latter also extending to the tibiæ; black, the elytra nigro-piceous, the head in front, the antennal joints 1 and 2, the knees, and the tarsi in part, testaceous; the elytra densely, finely, the rest of the upper surface very sparsely, punctured. Head (with the very large prominent eyes) much wider than the prothorax, bi-impressed in front; antennæ moderately long, stout, joint 1 comparatively slender, 2 short, 3 stouter, triangular, 4–10 sharply serrate. Prothorax rather narrow, as long as broad; deeply, transversely grooved before the base and also excavate towards the sides anteriorly, the depressions (as seen in profile) longitudinally confluent laterally. Elytra much broader than the prothorax, widening posteriorly and there twice the breadth of the latter, flattened on the disc, subtruncate at the apex, leaving five abdominal segments exposed. Anterior tarsal joint 1 slender, without comb.

Length 4½ mm.

Hab. Batchian, Labuan [Labocan] (*Doherty*).

One specimen, assumed to be ♀. This Batchian form may be known by its black body, the polished head and prothorax, and the densely, finely punctate, pubescent elytra; the large head and eyes; the stout, sharply serrate antennæ; and the laterally-confluent excavations on the prothorax. These characters separate *C. batchianus* from the Philippine *C. dapitanus* (type, ♂), which is the nearest allied species known to me; the latter has longer and less dilated antennæ, a smaller head, much smaller eyes, and more sparsely punctured elytra.

31. *Carphurus pilicornis*, sp. n. (Pl. I. fig. 9, antenna, ♂.)

♂. Very narrow, elongate, slender, shining, sparsely pubescent; black, the basal joint of the antennæ sometimes in part testaceous. Head wider than the prothorax, depressed, trifoveate, and finely punctured between the eyes, and obliquely narrowed behind them, the eyes prominent, rather small; antennæ shortly pilose, very long, rather slender, about reaching the apices of the elytra, joints 4–10

elongate-triangular, 1–3 nodose. Prothorax about as broad as long, almost smooth, depressed before the base and at the sides anteriorly. Elytra subparallel, a little longer than the five exposed abdominal segments, sparsely punctulate. Terminal abdominal segment truncate at tip. Legs slender; anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the outer half beneath.

♀. Antennæ much shorter, subfiliform; head trifoveate.

Length $2\frac{3}{4}$–$3\frac{1}{2}$ mm.

Hab. S. India, Kodaikanal (*T. V. Campbell*).

Three ♂♂, one ♀. Narrower than *Carphuroides dentiger* (infra) from the same locality; the antennæ less elongate and feebly serrate in ♂, slender and subfiliform in ♀; the fourth tarsal joint more distinctly lobed, the prothorax depressed at the base and sides. The general facies is that of a *Malthodes*, for which the present insect might be mistaken. The ♂ tarsal comb is not easily seen. Specimens of this species and of *C. dentiger* have been presented to the British Museum by Mr. E. A. Butler.

32. *Carphurus tener*, sp. n.

♂. Elongate, very narrow, shining, finely pubescent; black or piceous, the elytra brownish, the basal two or three joints of the antennæ in part, the tibiæ, and the tarsi more or less, testaceous. Head (including the prominent eyes) much broader than the prothorax, triangular, obliquely narrowed behind, closely punctured, the interocular space trifoveate; antennæ very long, rather stout, joints 4–10 elongate-triangular, 1–3 somewhat nodose. Prothorax narrow, convex, broader than long, narrowed anteriorly, laterally compressed, almost smooth. Elytra soft, coriaceous, elongato-subquadrate, slightly widened posteriorly, longer than the exposed four or five abdominal segments, closely, finely punctured. Terminal abdominal segment bifid at tip. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate in its outer half beneath.

Length $2\frac{1}{5}$–3 mm.

Hab. Ceylon, Dikoya and Bogawantalawa, alt. 3800–5200 ft. (*G. Lewis*: xii. 1881–iii. 1882).

Six ♂♂. This insect has wholly the facies of a small *Malthodes*, differing from that genus in the relatively broader elytra, conical abdomen, &c., the ♂ with tarsal comb and simple genital structure. The bifid terminal segment of the abdomen, the testaceous tibiæ, and the brownish, coriaceous, more closely punctured elytra separate

C. tener from the same sex of *C. pilicornis*, which has similar antennæ. *Maltypus infuscatus*, Motsch., also from Ceylon, cannot be conspecific with the present insect.

33. *Carphurus molliculus*, sp. n.

♂. Very elongate, narrow, polished, sparsely pilose; black, the antennal joints 1 and 2 or 1–3 (except 1 above) in great part testaceous, the elytra soft and somewhat transparent, the legs sometimes paler. Head (including the rather small prominent eyes) wider than the prothorax, finely punctured, triangularly depressed and bifoveate between the eyes; antennæ moderately long, rather stout, serrate from the fourth joint onward, 1–3 subnodose. Prothorax narrow, nearly as long as broad, convex, compressed laterally towards the base, almost smooth. Elytra a little broader than the head, as long as the exposed five abdominal segments, subparallel, depressed along the suture at the base, obsoletely punctulate. Terminal abdominal segment truncate at tip. Anterior tarsal joint 1 slightly thickened, as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Antennæ a little shorter, more slender, subfiliform; head not wider than the prothorax.

Length 3–3½ mm.

Hab. Ceylon, Dikoya, alt. 3800–4200 ft. (*G. Lewis*: xii. 1881–ii. 1882).

Two ♂♂, two ♀♀. A very narrow, elongate, polished black insect, with a latero-basally compressed prothorax and soft translucent elytra. A close ally of the S. Indian *C. pilicornis*, with smoother elytra, the antennæ of the ♂ much shorter and less pilose, those of the ♀ a little shorter. The fourth tarsal joint is very little broader than in the species here placed under *Carphuroides* (infra).

34. *Carphurus subluteolus*, sp. n.

♀. Very elongate, narrow, shining, pubescent; testaceous, the eyes black, the intermediate joints of the antennæ slightly infuscate in two examples; the head and prothorax closely, finely punctured, the latter smoother down the middle of the disc in one specimen and rugulose at the sides, the elytra somewhat transparent, alutaceous, minutely punctate. Head about as wide as the prothorax, the eyes moderately large; antennæ long, subfiliform. Prothorax as long as broad, transversely grooved before the base and apex. Elytra widened posteriorly, as long as the exposed

five abdominal segments. Anterior tarsal joint 1 short, without comb.

Length 3–3½ mm.

Hab. Moluccas, Batchian [type] and Ternate (*Wallace, in Mus. Oxon.*).

Three ♀ ♀, varying a little *inter se*. They agree very nearly with Erichson's description of *C. luteolus*, based on a ♂ from the Island of Bintam, near Singapore, except as regards the antennæ, which are said to be "minus elongatæ, subserratæ, apice nigricantes," the Batchian insect having these organs (in ♀) long and subfiliform. The sides of the prothorax, too, are rugulosely punctured in the latter, of which Erichson says nothing.

35. *Carphurus dichroma*, sp. n.

♂. Moderately elongate, shining, sparsely pilose; testaceous, the eyes, elytra, and metasternum black, the penultimate joint of the tarsi sometimes infuscate; the entire upper surface very sparsely punctulate. Head as wide as the prothorax, transversely depressed and trifoveate between the eyes, the latter rather small, prominent; antennæ stout, filiform, moderately long. Prothorax a little broader than long, deeply transversely sulcate before the base and also on each side anteriorly. Elytra oblong-subquadrate, leaving four or five abdominal segments exposed, slightly narrowed anteriorly, and transversely depressed below the base. Legs stout, comparatively short; anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Head a little smaller; antennæ as in ♂; anterior tarsi without comb.

Length 2⅕–3½ mm.

Hab. Larat (*F. Muir*); Tenimber, Jandema (*Doherty*: ♀).

Two pairs from Larat, a larger ♀ from Tenimber. A small testaceous insect, with black, comparatively smooth elytra, stout, filiform antennæ in the two sexes, small eyes, and rather stout legs, these characters separating it at once from *C. dispar*, Er., ♂.

36. *Carphurus timorensis*, sp. n.

♂. Elongate, narrow, shining, finely cinereo-pubescent; black, the five or three basal joints of the antennæ and the legs in part (the bases of the femora and the middle of the tibiæ more or less infuscate) testaceous, the head and prothorax rufo-testaceous; the entire upper surface very finely,

rugulosely punctured. Head (with the rather prominent eyes) a little wider than the prothorax, feebly bi-impressed anteriorly; antennæ very long, stout, subfiliform, joint 2 transversely widened, 3 a little longer than 2, the others gradually increasing in length. Prothorax transversely subcordate, depressed before the base. Elytra much wider than the prothorax, hollowed on the disc below the base, rather elongate, leaving four or five abdominal segments exposed. Legs slender; anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the entire lower edge.

♀. Antennæ not so stout; eyes a little smaller.

Length 3 mm.

Hab. Dutch Timor, Mt. Leo, alt. 2000–4000 ft. (*Doherty*).

Two ♂♂, one ♀. Near *C. subluteolus*, a testaceous insect inhabiting Batchian and Ternate, with a longer, shining, and more deeply impressed prothorax, and also differing from it in having the elytra, metasternum, and abdomen black. The much longer and stouter antennæ and the closely punctured, duller upper surface separate *C. timorensis* from the similarly coloured *C. dimidiatus* type from Tenasserim.

37. *Carphurus dimidiatus*, sp. n.

♂. Elongate, narrow, shining, sparsely pubescent; black, the head (eyes excepted), antennæ (the more or less infuscate joints 6–11 excepted), prothorax, anterior legs, and in one specimen (♀) the two terminal abdominal segments also, testaceous, the other legs more or less infuscate; the upper surface very finely punctured (the prothorax smoother in the example with the apex of abdomen testaceous. Head (including the rather small prominent eyes) a little wider than the prothorax, the interocular space bifoveate; antennæ rather slender, slightly thickened towards the tip, subfiliform, moderately long. Prothorax about as long as broad, narrowed behind, transversely sulcate before the base and on each side anteriorly. Elytra elongato-subquadrate, leaving five abdominal segments exposed. Legs slender; anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate at the apex beneath.

♀. Antennæ as in ♂; anterior tarsi without comb.

Length $2\frac{1}{2}$–$3\frac{1}{2}$ mm.

Hab. Tenasserim, Tavoy and Mergui (*Doherty*).

One ♂, four ♀♀, varying in the colour of the abdomen and in the sculpture of the prothorax. The slender, partly

infuscate legs and antennæ, and the less extended ♂ tarsal comb, distinguish *C. dimidiatus* from *C. dichroma*. The ♀ is rather like one of the varieties of *C. rougeri*, Pic, from Assam, which has a very different front foot in ♂ and stouter limbs. The same coloration is common to various other members of the genus, Australian and Malayan.

38. *Carphurus albipes*.

Carphurus albipes, Pic, Mélanges exot.-entom. xxv. p. 9 (1917).

♂. Anterior tarsal joint 1 nigro-pectinate in its outer half beneath.

Hab. New Guinea (*type of Pic*: *Wallace, in Mus. Oxon.*).

A ♂ found by Wallace, length 2½ mm., seems to be a small specimen of this species. It is a very elongate, extremely narrow, black insect, with the front of the head, the basal joints of the antennæ, and the abdomen obscurely rufescent, and the legs yellow; the antennæ filiform; the head and prothorax strongly punctured, the latter about as long as broad, rugose at the sides, and transversely sulcate before the base; the elytra elongate, parallel, finely punctured, as long as the five exposed terminal segments; the legs very slender.

39. *Carphurus scabridus*, sp. n.

♂. Elongate, narrow, moderately shining, finely pubescent; nigro-piceous, the antennal joints 1–4 (except a dark line on 1 above) testaceous, the rest of the antennæ, the abdomen, and legs (the tarsi in part excepted) black; the entire upper surface (the abdomen excepted) densely, very finely rugulose, the prothorax rougher at the sides than on the disc. Head as wide as the prothorax, bi-impressed in front, the eyes rather small; antennæ long, filiform, rather stout, joint 2 widened. Prothorax as long as broad, rounded at the sides, a little narrowed behind, transversely grooved before the base. Elytra depressed below the base, elongato-subquadrate, truncate at the tip, leaving five abdominal segments exposed. Anterior tarsal joint 1 as long as 2 and 3 united, finely pectinate beneath.

♀. Larger, piceous in colour, the head in front, the antennal joints 1–4, and the tarsi almost entirely, testaceous, the elytra brownish, with the base and apex darker; the head more coarsely punctured, the eyes larger, the antennæ much longer and stouter, the prothorax subcordate.

Length 2½–3¼ mm. (♂ ♀.)

Hab. Buru, Ilat (*Doherty*: type, ♂); Mysol (*Wallace, in Mus. Oxon.*: ♀).

One specimen from each island, the much larger slightly immature ♀ almost certainly belonging to the same species. A small, roughly punctulate, nigro-piceous or piceous insect, with the basal four joints of the antennæ and the tarsi in part testaceous, and rather stout, long, filiform antennæ. An isolated form.

40. *Carphurus filicornis*, sp. n.

? *Carphurus dispar*, Er. Entomographien, p. 133 (♀, nec ♂) (1840).

♂. Elongate, narrow, shining, finely pubescent; black, the antennæ with the four or five basal joints wholly or in part, and sometimes the tarsi also, testaceous; the upper surface very finely punctulate, the prothorax almost smooth on the disc anteriorly. Head not wider than the prothorax, slightly hollowed or bi-impressed in front, the eyes rather small; antennæ long, filiform, joint 2 thickened, transversely widened as seen in profile. Prothorax transverse, convex, rounded at the sides and narrowed behind, transversely sulcate before the base. Elytra widened posteriorly, a little longer than the four or five exposed abdominal segments. Legs slender: anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Antennæ filiform as in ♂, joint 2 a little less transverse.

Length 2–3 mm.

Hab. Singapore [types] (*C. F. Baker*: ♂: No. 17043; *Wallace, in Mus. Oxon.*: ♀); Bintam Isl. (*Erichson*: ♀); Penang (*G. E. Bryant*: xi. 1913: ♂); Perak, Siam, Tenasserim (*Doherty*); Sula Isl. (*Wallace*); Borneo, Sandakan, Philippines, Mindanao and Palawan (*Baker*).

The above description is taken from a pair from Singapore, the ♀ much larger than the ♂, and from numerous other examples of small size from the localities above quoted. The ♂ of *C. dispar*, as here identified, from Singapore and Penang, is a very different insect. The filiform antennæ in both sexes, with broad second joint, and transverse, basally sulcate prothorax, should separate *C. filicornis* from *C. nigrinus*. Two of the ♂♂ from Sandakan have much larger eyes.

41. *Carphurus nigrinus*.

♀. *Carphurus nigrinus*, Gorh. Ann. Soc. Ent. Belg. xxxix. p. 321 (nec supposed ♂) (1895).

Hab. S. India, Belgaum (*ex coll. Andrewes, in Mus. Brit.*).

The type of this small form (length 3½ mm.) is black, with the front of the head and the two basal joints only of the antennæ rufo-testaceous; the eyes rather small; the antennæ comparatively slender, subfiliform; the prothorax as broad as long, much narrowed behind, rugulosely punctured laterally, and feebly transversely strigose on the disc posteriorly; the elytra moderately elongate (leaving five segments exposed), finely punctulate; the legs slender. The supposed ♂ of *C. nigrinus* * is a ♀ of an allied species, with stouter, subserrate antennæ; it is here referred to *C. nigritulus* (No. 27).

42. *Carphurus zeylanicus*, sp. n.

♂. Elongate, narrow, slender, shining, sparsely pilose; black, the antennal joints 1 and 2 wholly or in part testaceous, the terminal three segments of the abdomen rufescent; the head and prothorax sparsely, minutely punctured, the elytra duller, coriaceous, obsoletely punctulate. Head small, slightly wider than the prothorax, bisulcate anteriorly, the eyes somewhat prominent; antennæ long, subfiliform, rather slender, joints 3–10 longer than broad. Prothorax convex, a little broader than long, compressed laterally, and transversely depressed on each side before the base and apex (the depressions appearing longitudinally confluent towards the outer margin when seen in certain lights). Elytra subparallel, rather longer than the exposed abdominal segments. Legs slender; anterior tarsal joint 1 as long as 2 and 3 united, nigro-pectinate along the outer half beneath.

♀. Antennal joints 1–4 and tarsi in part testaceous, the abdomen black; antennæ a little more slender.

Length 2½–3½ mm.

Hab. Ceylon, Bogawantalawa, alt. 5000 ft. [type, ♂], and Kitulgalle, alt. 1700 ft. [♀] (*G. Lewis*: i., ii. 1882).

One pair. Narrower than *C. nigritulus*, the elytra duller and obsoletely punctulate, the terminal segments of the ♂ abdomen rufous, the antennæ in ♂ a little stouter, shorter, and less filiform than in the same sex of *C. filicornis*.

43. *Carphurus matanganus*, sp. n.

♂. Moderately elongate, somewhat robust, shining, finely cinereo-pubescent; nigro-piceous, the antennal joints 1–6 and the tibiæ and tarsi clear testaceous; the upper surface

* Quoted under the specific name *nigrurius* by Pic in his diagnosis of *C. maduraensis* (1921).

very finely punctulate. Head as wide as the prothorax, trifoveate between the eyes, the latter rather large; antennæ stout, very long, about reaching the apex of the elytra, joints 6–10 much longer than broad, slightly widened outwards. Prothorax transverse, very convex, sinuously narrowed behind, deeply, transversely sulcate before the base and also deeply excavate on each side anteriorly. Elytra rather broad, widened posteriorly, depressed on the disc below the base, leaving about four abdominal segments exposed. Legs not very slender; anterior tarsal joint 1 as long as 2 and 3 united, conspicuously nigro-pectinate along the lower edge.

Length 2½ mm.

Hab. Borneo, Mt. Matang, W. Sarawak (*G. E. Bryant*: i. 1914).

One ♂. A dull black form allied to *C. filicornis*, with the basal half of the antennæ, the tibiæ, and tarsi testaceous, the antennæ themselves unusually long and stout for such a small insect.

44. *Carphurus atricolor*, sp. n.

♂. Moderately elongate, very shining, sparsely cinereo-pubescent, with longer hairs intermixed; deep black, the basal joints of the antennæ in part and the tips of the tarsi testaceous; the entire upper surface very sparsely punctulate. Head not wider than the prothorax, bi-impressed in front, the eyes small; antennæ long, stout, filiform, joint 2 transverse, subquadrate, 1 somewhat thickened. Prothorax broader than long, convex, rounded at the sides, deeply transversely grooved before the base. Elytra wider than the prothorax, moderately long, truncate at the apex, leaving four or five abdominal segments exposed, transversely depressed below the base. Legs not very elongate; anterior tarsal joint 1 short, nigro-pectinate beneath.

♀. Antennæ similar.

Var. Abdomen testaceous.

Length 2¾–3½ mm.

Hab. Dutch Timor, Mt. Leo, alt. 2000–4000 ft. [types: ♂ ♀]. Allor Is., Pura and Maru [♂], and Letti I. [♀, var.] (*Doherty*); Ceram (*Wallace, in Mus. Oxon.*: ♀).

Numerous examples. A small, very shining, glossy black, comparatively smooth insect, with stout, filiform antennæ, extremely like *C. nodicornis* and *C. papuanus* (infra), from New Guinea or Mysol: but with the basal joint of the antennæ very slightly thickened in ♂, the elytra relatively shorter

in ♀. *C. dichroma*, from Larat and Tenimber, and *C. matanganus*, from Sarawak, have similar antennæ, these organs being much stouter than in *C. filicornis*.

45. *Carphurus enganoensis*, sp. n.

♀. Moderately elongate, shining, finely pubescent; black, the antennal joints 1–5 testaceous; the head and prothorax sparsely, finely punctured, the elytra extremely finely rugulose and obsoletely punctulate. Head short, narrower than the prothorax, bisulcate anteriorly and with a shallow fovea between the eyes, the latter small; antennæ rather stout, subfiliform, joints 3–10 a little longer than broad. Prothorax convex, narrowed behind and also in front, narrowly grooved at the base. Elytra somewhat rounded at the sides, widened posteriorly, longer than the exposed four abdominal segments. Abdomen broad, rapidly narrowing posteriorly. Legs comparatively short; anterior tarsal joint 1 without comb.

Length 2½ mm.

Hab. Sumatra, Engaño Isl. (*Doherty*).

One specimen, assumed to be ♀. A very small black form, with the basal half of the antennæ testaceous, the antennæ stout and subfiliform, the head small and short, the prothorax very convex, the elytra and abdomen rather broad, the legs comparatively short and infuscate. Allied to *C. nigrinus* and *C. filicornis*, but differing in various respects from the ♀ ♀ of these species. *C. niasensis*, Pic (1917), seems to approach the present insect.

46. *Carphurus rouyeri*. (Pl. I. fig. 10, front tarsus, ♂.)

♀. *Carphurus rouyeri*, Pic, L'Echange, xxii. p. 57 (1906)?
Carphurus rouyeri v. *obscurior*, Pic, Mélanges exot.-entom. xxxiii. p. 19 (May 1921).
Var.? *Carphurus discoidalis*, Pic, Mélanges exot.-entom. xxv. p. 8 (1917).

♂. Very elongate, narrow, sparsely pilose, shining; black, the head (except at the base or behind the eyes) rufescent, the three or four basal joints of the antennæ, the anterior legs, and usually the intermediate femora also testaceous, the elytra with a broad, flavescent, semitransparent median fascia of variable width. Head wider than the prothorax, almost smooth, with a trifoveate transverse depression between the eyes, the latter large and prominent; antennæ slender, extremely long, joints 4–10 elongate-triangular. Prothorax as long as broad, convex, rounded at the sides,

narrowed behind, almost smooth, deeply transversely sulcate before the base and also depressed on each side anteriorly. Elytra soft, about as long as the five exposed abdominal segments, parallel at the base, a little widened posteriorly, very finely punctured. Legs long; anterior tarsal joint 1 thickened, elongate, as long as 2–5 united, nigro-pectinate along the entire lower edge, joint 2 articulated to it at about the middle, 1 reaching as far as the apex of 3.

♀. Antennæ very much shorter, subfiliform; eyes smaller; anterior tarsal joint 1 narrow, simple, not longer than 2 and 3 united.

Var. ? The elytra without trace of fascia, the prothorax in ♀ in great part testaceous (the margins only infuscate); the antennæ of ♂ stouter and with the elongated joints 4–10 more sharply triangular, the anterior tarsi in this sex with an elongated nigro-pectinate basal joint as in *C. rouyeri*, Pic.

Length 3–4½ mm.

Hab. Borneo, Mt. Matang, Quop, and Kuching in Sarawak (*G. E. Bryant*: ♂ ♀), Banguey Isl. (type of *C. discoidalis*, Pic); Sumatra, Paja Kombo (types of *C. rouyeri* and var., Pic); Perak; Penang; Assam, Patkai Mts. and Sudiya (*Doherty*: ♂ ♀, var.).

The above description is taken from numerous ♂ ♂ and ♀ ♀ from Sarawak, the ♀ ♀ from the other localities quoted agreeing with the latter and with Pic's diagnosis of *C. rouyeri*. A narrow, shining, slender, black insect, with a rufescent, trifoveate head, the antennæ and legs partly testaceous, and the elytra with a broad, flavous, semitransparent median fascia; the ♂ with extremely elongate, serrate antennæ, and an unusually long, nigro-pectinate basal joint to the anterior tarsi. *C. discoidalis*, Pic, from Banguey, diagnosed in twelve words, and the Assam pair above noted, seem to be extreme forms of the same species. A small immature ♀ from Kuching, Sarawak, with the head and anterior legs infuscate, and a broad subapical whitish elytral fascia, may represent *C. discoidalis*. *C. elegans*, Lea, has a similarly elongate basal joint to the anterior tarsi in ♂.

47. *Carphurus luzonicus*, sp. n.

♂. Extremely like *C. rouyeri*, Pic; black, the antennal joints 1–4, head, prothorax (three oblong streaks—lateral and median—at the base excepted), and legs testaceous, the elytra with a yellowish, semitransparent, narrow streak extending downward from the humeri: the head broad, transversely depressed and trifoveate between the eyes, the

latter large; the antennæ equally long, reaching the tip of the elytra, joints 3–10 elongate-triangular; the prothorax almost smooth, transversely sulcate before the base and on each side anteriorly; the elytra subparallel, leaving five segments exposed; the anterior tarsi with joint 1 thickened, as long as the others united, nigro-pectinate along the entire lower edge.

Length 4 mm.

Hab. Philippines, Mt. Makiling, Luzon (*Baker*, *in Mus. Brit.*: No. 17047).

Described from a ♂ from Luzon; a second example, also ♂, narrower, with the prothorax entirely and the abdomen in great part testaceous, from the Island of Basilan (*Baker*), doubtless belongs to the same species. This is a Philippine form of *C. rouyeri* with the prothorax and legs testaceous, and the elytra with a narrow, oblique, semi-transparent, humeral streak. It cannot be treated as a variety of that species, and a separate name is required for it. The elongate, thickened basal joint of the ♂ anterior tarsi and the much longer, more feebly serrate antennæ in the same sex separate *C. luzonicus* from *C. dispar* and *C. basilanus*.

48. *Carphurus scutatus*, sp. n.

♀. Elongate, narrow, shining, finely pubescent, with longer hairs intermixed; black, the head, prothorax, and scutellum rufo-testaceous, the antennal joints 1–4, elytra (a triangular scutellar patch and an apical fascia excepted), and legs (the femora in part and the tips of the tarsi excepted) testaceous; head and prothorax almost smooth, the elytra sparsely punctulate. Head not wider than the prothorax, bi-impressed in front and foveate in the middle between the eyes, the latter moderately large and not prominent; antennæ rather slender, moderately long, somewhat filiform, joints 4–10 oblong-subtriangular. Prothorax as long as wide, relatively broad, deeply transversely depressed before the base and shallowly so towards the apex. Elytra wider than the prothorax, as long as the five exposed abdominal segments, subparallel. [Anterior tarsi wanting.]

Length 4¼ mm.

Hab. Gt. Sanguir, Taruna [Taroena], alt. 2000 ft. (*Doherty*).

A single example, one of two species of *Carphurus*, found by Doherty on this island, which lies between Mindanao and Celebes. It may be the ♀ of *C. luzonicus*, type ♂; but this is not likely to be the case, the eyes being

ess prominent and the head not wider than the comparatively broad prothorax, characters separating *C. scutatus* from the variable *C. rougeri*, Pic. The antennæ are less filiform than in the ♀ of the latter.

49. *Carphurus nodicornis*, sp. n. (Pl. I. fig. 11, antenna, ♂.)

♂. Elongate, shining, very sparsely pilose (abraded); black, the four basal joints of the antennæ testaceous beneath, the puncturing of the entire upper surface minute and very sparse. Head about as wide as the prothorax, bi-impressed between the eyes, the latter small; antennæ long, stout, filiform, joint 1 enormously thickened, oblongo-subquadrate. Prothorax broader than long, very convex, rounded at the sides, deeply transversely sulcate before the base. Elytra about two and a half times the length of the prothorax, subparallel, transversely depressed below the base, rounded at the tip, leaving four or five segments exposed. Anterior tarsal joint 1 short, feebly nigro-pectinate beneath.

♀. Antennal joint 1 much less thickened, normal.

Length 3–4½ mm.

Hab. New Guinea [type, ♂] and Mysol [♂ ♀] (*Wallace, in Mus. Oxon. and Mus. Brit.*).

Two ♂ ♂ and one ♀. More robust than the Indian *C. nigrinus*, Gorh., with much longer and stouter antennæ, the basal joint of which is greatly enlarged in ♂; the prothorax larger, more convex, and deeply transversely sulcate behind; the elytra much smoother. A strongly incrassate basal joint to the ♂ antennæ is also to be found in the Australian *Helcogaster foveicornis* (1909) and *H. insignicornis* (1921), Lea, and *Carphurus cyaneipennis*, Macl. (1872), and in *Carphuromorphus validicornis*, Pic (1917), from Ké Island. Following Lea's arrangement, this species and the following would belong to the genus *Helcogaster*.

50. *Carphurus papuanus*, sp. n. (Pl. I. fig. 12, ♂.)

♂. Elongate, shining, the elytra closely, the rest of the surface very sparsely pubescent; black, the basal four joints of the antennæ in great part testaceous; the head and prothorax finely punctured, the latter smooth along the middle of the disc, the elytra densely, subrugulosely punctured. Head short, narrower than the prothorax, transversely depressed between the eyes, the latter small; antennæ long, rather stout, filiform, joint 1 greatly thickened. Prothorax convex, a little broader than long, rounded at the sides,

deeply transversely grooved before the base and also transversely hollowed on each side anteriorly. Elytra a little more than twice the length of the prothorax, narrowed anteriorly, flattened along the suture below the base, rounded at the tip, leaving five segments exposed. Anterior tarsal joint 1 narrow, as long as 2 and 3 united, nigro-pectinate beneath.

Length 4⅕ mm.

Hab. New Guinea, Dorey (*Wallace, in Mus. Oxon.*).

One ♂. Very like *C. nodicornis*, a species occurring in the same island; the basal joint of the ♂-antennæ also dilated; the head smaller; the prothorax not so smooth, and transversely depressed on each side anteriorly, as well as near the base; the elytra densely, rugulosely punctured.

Carphuroides, gen. nov.

Tarsal joints 2–4 narrow, 4 small, feebly lobed, rounded at apex, and semicircularly excavate above, joint 1 of anterior pair with a closely pectinate comb beneath in ♂; head without prominent tubercles or carinæ in ♂, very similar in the two sexes; antennæ flabellate, pectinate, dentate, or serrate in ♂, serrate in ♀; prothorax without definite sulci or impressions, almost smooth; the other characters as in *Carphurus*, Er. (type *C. dispar*, ♂).

Type, *Helcogaster pectinatus*, Sharp.

In addition to *H. pectinatus*, the following species belong to *Carphuroides* as here defined:—*H. atratulus*, Gorh. (type, ♂), Central America; *H. vitreatus*, Champ., Rhodesia: *Carphurus plagiatus*, Kies. (type, ♂), Japan: *C. picipennis*, Gorh. (type, ♂), Belgaum; and various other forms from Southern India, Ceylon, or the Malayan region. The tarsal comb of the ♂, which cannot be seen from above, was overlooked by Sharp, Kiesenwetter, Gorham, and myself*; but on examining the tarsi from beneath it is plainly visible. The general facies of these Omaliiform insects is very similar, and several of them have a semi-transparent streak or elongate space on the disc of the elytra, hence the specific names *plagiatus* and *vitreatus*. The genus seems to be a natural one; but the geographical distribution of the species is difficult to understand, unless they are carried by commerce; one, *C. pectinatus*, has almost certainly been introduced into the Hawaiian Islands, as

* The words "without comb" must therefore be erased from the description of *H. vitreatus* [Ann. & Mag. Nat. Hist. (9) x. p. 356, Oct. 1922].

noted by its describer. *Carphurus* (?) *opacus*, Pic (1908), from Buenos Aires, is probably very different from any of the eastern forms.

1. *Carphuroides anamalaicus*, sp. n. (Pl. I. fig. 13, antenna, ♂.)

♂. Elongate, shining, sparsely pilose; black, the antennal joints 1 and 2 partly testaceous, the elytra (except at the apex) fusco-testaceous and somewhat transparent. Head (as seen detached) large, long, and convex, obliquely narrowed behind the eyes, closely punctured, with an irregular, V-shaped, interocular depression formed by three confluent foveæ; eyes rather prominent, not very large; antennæ pilose, flabellate from joint 5 onward, the basal joints stout. Prothorax narrow, barely as long as broad, rounded at the sides anteriorly, almost unimpressed; very sparsely, finely punctured. Elytra rather more than twice the length of the prothorax, subparallel, leaving four segments exposed, sparsely punctulate. Legs slender; tarsi subfiliform, joint 4 small and slightly hollowed at the apex above, joint 1 of anterior pair about as long as 2 and 3 united, nigro-pectinate beneath.

Length 3 mm.

Hab. S. India, Anamalai Hills (*ex coll. Andrewes, in Mus. Brit.*).

One male. This is the only Malayan or Indian species of the group in the collections before me with flabellate antennæ in ♂. It is so closely related in other respects to *C. plagiatus*, Kies., and *C. pectinatus*, Sharp, that it must be included in the same genus. *C. anamalaicus* differs from the Australian species placed by Lea under the preoccupied generic name *Balanophorus*, Macl., in having slender subfiliform tarsi.

2. *Carphuroides pectinatus*. (Pl. I. figs. 14, ♂; 14 *a*, posterior tarsus, ♂.)

♂. *Helcogaster pectinatus*, Sharp, Trans. R. Dublin Soc. (2) iii. pp. 157, 241, 284, t. 4. fig. 20 (1885).

♀. *Carphurus astruci*, Pic, Mélanges exot.-entom. xxviii. p. 4 (1918)?

♂. Head (including the rather large prominent eyes) broader than, and deeply sunk into, the prothorax (the long basal portion thus being invisible till the head is drawn out of the cavity), with a V-shaped bi-impressed depression between the eyes which is produced into a short sulcus above; antennæ long, stout, strongly dentato-pectinate, joints 1

and 2 testaceous ; anterior tarsal joint 1 about as long as 2 and 3 united, nigro-pectinate beneath, 2–4 short, small ; terminal dorsal segment of abdomen emarginate at tip.

♀. Head (and eyes) smaller, not wider than the prothorax, trifoveate ; antennæ shorter, obliquely serrate, joints 1–3 testaceous.

Length 3–4 mm.

Hab. Hawaiian Is., Honolulu (type of *H. pectinatus*, ♂) ; Portuguese Timor, Dilli (*Doherty* : ♂) ; Borneo, Pengaron (*Doherty* : ♂) ; China (*ex coll. Bowring* : ♀), Kurseong (type of *C. astruci*, Pic : ♀) ; Assam, Sylhet (*Mus. Brit.* : ♂ ♀) ; India (*Mus. Oxon.* : ♀).

Six ♂ ♂ and two ♀ ♀ of this species are contained in the collections before me. It is recognizable by the black, shining body ; the testaceous basal joints of the antennæ ; the deflexed, retractile head ; the almost smooth, unimpressed prothorax, and the relatively elongate, strongly punctured, posteriorly-widened, piceous elytra, which are sometimes partly transparent. The imperfect ♂ from Timor seems to be a small narrow example of the same species. The pectinate antennæ in the ♂ separates *C. pectinatus* from *C. plagiatus*, Kies. The Hawaiian specimens were found on the windows of a house in Honolulu, and the insect is recorded from there as a doubtful native. *C. astruci* is almost certainly a ♀ of *C. pectinatus*.

3. *Carphuroides dentiger*, sp. n. (Pl. I. fig. 15, antenna, ♂.)

♂. Elongate, narrow, shining, finely pubescent ; black, the elytra sometimes piceous. Head a little wider than the prothorax, with a V-shaped depression between the eyes, the latter small and rather prominent ; antennæ shortly pilose, as long as the body, stout, joints 1–3 thickened, 4 and 5 broader, triangular, 6–10 each produced into a long sharp tooth. Prothorax nearly as long as broad, slightly rounded at the sides, almost smooth and unimpressed. Elytra long, subparallel, a little widened posteriorly, leaving four segments exposed, strongly punctured. Anterior tarsal joint 1 widened, somewhat triangular, nearly as long as 2–4 united, with 20 black teeth along the lower edge (text-fig. 4, *d*).

♀. Antennæ nearly one-half shorter, much less widened, simply serrate ; head bifoveate ; anterior tarsal joint 1 small, narrow, not longer than 2 and 3 united.

Length $2\frac{3}{4}$–$3\frac{1}{2}$ mm.

Hab. S. India, Kodaikanal (*T. V. Campbell*: ♂ ♀); Assam, Shillong (*F. W. C.*: ♀).

Described from five ♂ ♂ and one ♀ from Kodaikanal,

Fig. 4.

Carphuroides dentiger, ♂ : *a*, genitalia; *b* and *c*, details of ditto, more highly magnified; *d*, anterior tarsus from in front, the setæ on terminal joints omitted.

two ♀ ♀ from Assam apparently belonging to the same species. A small, narrow, shining black form, with a smooth, unimpressed prothorax, strongly punctured elytra.

and extremely elongate, stout, acutely dentate antennæ in the ♂, these organs in the ♀ short and simply serrate. The text-figures of the ♂ genital a and anterior tarsus (fig. 4, *a–d*) are taken from preparations made by Dr. Waterston. *C. plagiatus* and *C. pectinatus* are allied forms.

4. *Carphuroides plagiatus.*

♂. *Carphurus plagiatus*, Kies. Berl. ent. Zeitschr. 1874, p. 287.

♂. Head (including the prominent eyes) about as wide as the prothorax, with a V-shaped, interocular depression (formed by three confluent foveæ); antennæ rather slender, sharply serrate; prothorax almost smooth, subcylindrical; elytra about as long as the exposed portion of the abdomen, subparallel, semi-transparent, strongly punctured; anterior tarsi as in *C. pectinatus*, Sharp.

Hab. Japan, Nagasaki.

Described from a single example, one of two in the Lewis collection. Very like *C. pectinatus*, Sharp, ♂, with the head very little larger than in the ♀ of that species, the eyes smaller, the antennæ much more slender (described as "filiformes, acutius serratæ"), the elytra relatively shorter and less widened posteriorly.

5. *Carphuroides nilgiriensis*, sp. n.

Carphurus picipennis, Gorh. Ann. Soc. Ent. Belg. xxxix. p. 321 (♀, nec ♂) (1895).

♂. Elongate, shining, sparsely pilose; black, the antennal joints 1 and 2 testaceous beneath; the head and prothorax very sparsely, minutely punctate, the elytra also sparsely punctured. Head (including the rather prominent eyes) about as wide as the prothorax, triangularly depressed and bifoveate anteriorly; antennæ stout, moderately long, serrate. Prothorax barely as long as broad, convex, almost unimpressed. Elytra about as long as the five exposed abdominal segments, a little widened posteriorly. Tarsi with a small penultimate joint, joint 1 of anterior pair thickened, not longer than 2 and 3 united, nigro-pectinate along the lower edge.

♀. Head smaller, the eyes less prominent; antennæ more slender, much shorter, less strongly serrate.

Length $3\frac{1}{4}$-$4\frac{1}{4}$ mm.

Hab. India, Nilgiri Hills (*H. L. Andrewes, in Mus. Brit.*).

Two ♂ ♂ and two ♀ ♀. Smaller and narrower than *C. picipennis*, Gorh.; the elytra much shorter, less widened posteriorly, and more sparsely punctured; the antennæ of

♂ shorter, less dilated, and not so sharply serrate. Both insects have a small fourth tarsal joint. *Carphurus homalioides*, Bourg., from Cambodia, must be a nearly allied insect. *C. plagiatus*, Kies., from Japan, has more rugose elytra, and the antennal joints 4–10 of the same width, but acutely triangular in shape, in ♂.

6. *Carphuroides nitidulus*, sp. n.

♂. Elongate, narrow, shining, sparsely pilose; black, the antennal joints 1 and 2 partly testaceous, the elytra piceous and semitransparent, each with an oblong whitish patch on the disc beyond the middle. Head (including the rather prominent eyes) slightly wider than the prothorax, finely, sparsely punctured, bi-impressed between the eyes; antennæ moderately elongate, sharply dentato-pectinate, rather stout. Prothorax convex, broader than long, narrowed anteriorly, almost unimpressed, very sparsely punctured, smooth down the middle of the disc. Elytra slightly longer than the four or five exposed abdominal segments, subparallel, very little widened at the apex; sparsely, finely punctate. Terminal abdominal segment truncate at tip. Anterior tarsal joint 1 narrow, about as long as 2 and 3 united, nigro-pectinate along the lower edge.

♀. Head about as wide as the prothorax, the eyes less prominent; antennæ shorter, less dilated, serrate; elytra without the whitish spot; anterior tarsal joint 1 shorter, without comb.

Length $2\frac{1}{2}$–$3\frac{1}{2}$ mm.

Hab. Ceylon, Kandy [♂, type], Dikoya [♀], alt. 1500–4200 ft. (*G. Lewis*: ii. 1882).

One ♂, two ♀♀. Smaller and narrower than the Japanese *C. plagiatus*, Kies., the elytra much smoother, the antennæ of the ♂ sharply dentate, those of the ♀ formed much as in the ♂ of that species. The elytra are less widened behind and more finely punctured, and the antennæ are less thickened in both sexes, than in *C. pectinatus*, Sharp. The whitish elytral spot is evanescent.

7. *Carphuroides translucens*, sp. n.

♀. Elongate, Omaliiform, shining, sparsely pilose; black, the antennal joints 1 and 2 partly testaceous, the elytra (except at the apex) whitish and semitransparent; the head and elytra sparsely punctured, the prothorax much smoother.

Head (including the comparatively small eyes) barely as wide as the prothorax, short; antennæ moderately long, rather slender, sharply serrate. Prothorax about as long as broad, subcylindrical, almost unimpressed. Elytra long, widening posteriorly, leaving four segments exposed. Legs slender; anterior tarsal joint 1 small, short, without comb.

Length 3½ mm.

Hab. S. India, Nilgiri Hills (*T. V. Campbell*).

One ♀. Less robust than the Bornean *C. luciparens*, the legs and antennæ darker and much more slender, the head not rugose, the elytra elongate. The relatively broader head and prothorax and much longer elytra separate the present species from the Japanese *C. plagiatus*, Kies., which has similarly formed antennæ. It is not likely to be the ♀ of *C. anamalaicus*, the ♂ only of which is known.

8. *Carphuroides luteiventris*, sp. n.

♀. Very elongate, Omaliiform, shining, sparsely pilose; black, the two basal joints of the antennæ, elytra, and legs piceous or fusco-testaceous, the elytra somewhat transparent, the abdomen luteous. Head short, narrower than the prothorax, coarsely, closely (in one specimen rugosely) punctured, transversely depressed anteriorly, the eyes quite small; antennæ rather short, moderately stout, serrate. Prothorax transverse, convex, narrowed anteriorly, almost unimpressed, smooth on the disc, sparsely punctured at the sides. Elytra as long as the exposed five abdominal segments, widening from the base, subtruncate at the apex, strongly punctured. Abdomen broad, narrowing from the base. Legs rather slender.

Length 3½–5 mm.

Hab. Ceylon, Dikoya, alt. 3000–4200 ft. (*G. Lewis*: xii. 1881–ii. 1882).

Two ♀ ♀. Very like the widely-distributed *C. pectinatus*, Sharp, the head coarsely punctured (as in the Bornean *C. luciparens*), the antennæ (♀) less thickened, the abdomen luteous. These specimens cannot be referred to *Carphurus hæmorrhoidalis*, Motsch., from the same island, that insect having the antennæ long and slender (less strongly serrate than in his eastern *C. nigripennis*), the head, prothorax, and elytra uneven, and the three terminal segments of the abdomen only in part red.

9. *Carphuroides luciparens*, sp. n.

♀. Elongate, robust, Omaliiform, shining, very sparsely pubescent; black, the antennal joints 1–4, a broad triangular patch on each side of the second abdominal segment, tibiæ, and tarsi testaceous, the elytra (except along the suture and at the apex) flavescent and semitransparent. Head (including the rather small eyes) not wider than, and deeply sunk into, the prothorax, the exposed portion short, coarsely, rugosely punctured, much smoother in front; antennæ moderately long, stout, obliquely serrate. Prothorax subcylindrical, convex, a little broader than long, polished, almost impunctate, unimpressed. Elytra about as long as the five exposed abdominal segments, a little widened posteriorly; sparsely, strongly punctate. Legs stout; anterior tarsal joint 1 short, without comb.

Length 4½ mm.

Hab. Borneo, Quop in W. Sarawak (*G. E. Bryant*: 26. iii. 1914).

One example. More robust than *C. pectinatus*, Sharp, and *C. plagiatus*, Kies., the head rugosely punctured, the elytra yellowish, semitransparent, and rather sparsely punctured, the legs stouter, the tibiæ and tarsi testaceous.

10. *Carphuroides picipennis*.

Carphurus picipennis, Gorh. Ann. Soc. Ent. Belg. xxxix. p. 321 (♂, nec ♀) (1895).

♂. Antennæ sharply serrate, moderately long, stout; anterior tarsal joint 1 nigro-pectinate beneath, about as long as 2–4 united, the latter short, small.

Hab. S. India, Belgaum (*ex coll. Andrewes, in Mus. Brit.*).

An elongate, shining, pilose, piceous insect, superficially resembling a *Lesteva* or *Geodromicus*, with a broad, finely punctured, bi-impressed head; large eyes; a transverse, smoother, almost unimpressed prothorax, unusually elongate, posteriorly widened, strongly punctured elytra, leaving four segments exposed; and a small penultimate joint to the tarsi. The type (♂) agrees very nearly with the description of *Carphurus homalioides*, Bourg. (1890)*, from Cambodia, except that it is piceous instead of black. The ♀ labelled *picipennis* by Gorham belongs to a different species, *C. nilgiriensis* (No. 5).

* The same specific name has been used by Pic for a Sumatran insect (Mélanges exot.-entom. xxv. p. 8, 1917).

Alphabetical numbered list of species enumerated in the present paper; those without bracketed generic initials belong to Carphurus, *the others with the generic names abbreviated thus*: B. = *Brachyhedybius*, C. = *Choresine*, Ch. = *Carphuroides*, and N. = *Neocarphurus*; *the asterisk indicates that the species are described as new.*

adyena (C.), 1.
albipes, 38.
*amboynensis, 20.
*anamalaicus (Ch.), 1.
*annulipes (N.), 1.
*atricolor, 44.
*basalis, 25.
*basilanus, 15.
*batchianus, 30.
*bicolorata (C.), 2.
*bivittatus, 16.
*buruensis (C.), 3.
*celebensis, 3.
cinctipennis, 18.
*dapitanus, 29.
*dentaticornis, 13.
*dentiger (Ch.), 3.
*dichroma, 35.
*dilutus, 21.
*dimidiatus, 37.
dispar, 19.
dohertyi, 12.
*enganoensis, 45.
*fasciatifrons, 11.
*filicornis, 40.
*laratensis, 8.
*luciparens (Ch.), 9.
*luteiventris (Ch.), 8.
*luzonicus, 47.
malaccanus, 26.
*matanganus, 43.
*molliculus, 33.
*moluccana (C.), 4.
*muiri, 17.
nigrinus, 41.
*nigritulus, 27.
*nigroviolacea (C.), 5.
*nilgiriensis (Ch.), 5.
*nitidulus (Ch.), 6.
*nodicornis, 49.
*pallidulus, 10.
*papuanus, 50.
pectinatus (Ch.), 2.
*pengaronæ, 6.
*philippinus, 23.
picipennis (Ch.), 10.
*pilicornis, 31.
plagiatus (Ch.), 4.
plicaticollis, 1.
*rastratus, 2.
rouyeri, 46.
rubroannulatus, 14.
ruficeps, 5.
*sayeri, 7.
*scabridus, 39.
*scutatus, 48.
sinuatus (B.), 1.
*stenoderus (N.), 2.
*subluteolus, 34.
sumatrensis, 22.
*tener, 32.
testaceicolor, 9.
*timorensis, 36.
*tondanus, 28.
*translucens (Ch.), 7.
transparipennis, 24.
*wallacei, 4.
*zeylanicus, 42.

SYNONYMS, VARIETIES, ETC.

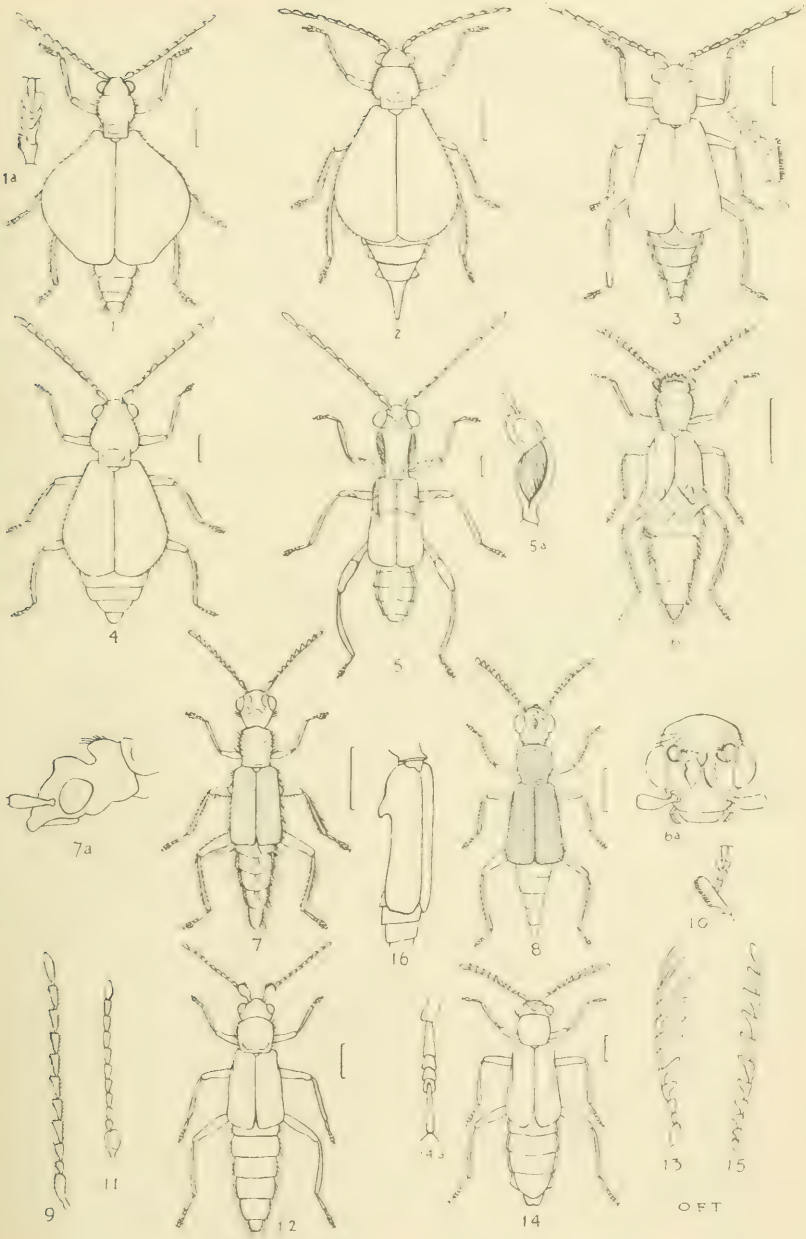
apicalis, 13.
astruci (Ch.), 2.
atromaculatus, 14.
? bipartitus, 24.
curdaiensis, 1.
cyaneipennis, 2.
? discoidalis, 46.
diversipennis, 14.
notaticollis, 1.
obscurior, 46.
rufithorax, 1.
? tonkineus, 14.
variiventris, 14.

Species recorded from the same regions not identified or wanting in the collections examined.

Balanophorus humeralis, Pic (1917), Banguey I.
„ *javanus*, Pic (1906), Java.
„ *macassarensis*, Pic (1917), Macassar.
Carphuromorphus validicornis, Pic (1917), Ké I.
Carphurus albonotatus, Pic (1922), Java.
„ *birmanicus*, Pic (1918), Burma.
„ *explanatus*, Pic (1922), Tonkin.
„ *hæmorrhoidalis*, Motsch. (1859), Ceylon.
„ *homalioides*, Bourg. (1890), Cambodia.
„ „ Pic (1917), Sumatra.
„ *limbifer*, Motsch. (1854), Ind. Or.
„ *luteolus*, Er. (1840), Bintam I.
„ *lutunganus*, Pic (1917), Lutungan I.
„ *madurensis*, Pic (1921), Madura [? Java or India].
„ *niasensis*, Pic (1917), Nias I.
„ *nigripennis*, Motsch. (1854), Ind. Or.
„ *nigroabdominalis*, Pic (1917), Banguey I.
„ *reflexicollis*, Pic (1917), Banguey I.
„ *rubriventris*, Motsch. (1859), Ind. Or.
„ *rufifrons*, Pic (1921), Formosa.
„ *rufonotaticeps*, Pic (1917), Celebes.
„ *serricornis*, Fairm. (1883), New Britain.
„ *subcæruleipennis*, Pic (1917), Sumatra.
Helcogaster impressiceps, Pic (1917), Ké I.
Microcarphurus atriventris, Pic (1921), Sumatra.
„ *borneensis*, Pic (1917), Borneo.
„ *brunneiventris*, Pic (1917), Aru I.

EXPLANATION OF PLATE I.

Fig. 1. *Choresine advena*, Pasc., ♂ ; 1 *a*, anterior tarsus.
Fig. 2. „ „ „ ♀.
Fig. 3. „ *bicolorata*, sp. n., ♂ ; 3 *a*, anterior tarsus.
Fig. 4. „ *moluccana*, sp. n., ♀.
Fig. 5. *Neocarphurus annulipes*, sp. n., ♂ ; 5 *a*, profile of head and prothorax.
Fig. 6. *Brachyhedybius sinuatus*, Pic, ♂ ; 6 *a*, head from in front.
Fig. 7. *Carphurus laratensis*, sp. n., ♂ ; 7 *a*, head in profile.
Fig. 8. „ *rastratus*, sp. n., ♂.
Fig. 9. „ *pilicornis*, ♂, antenna.
Fig. 10. „ *rouyeri*, Pic, ♂, anterior tarsus.
Fig. 11. „ *nodicornis*, sp. n., ♂, antenna.
Fig. 12. „ *papuanus*, sp. n., ♂.
Fig. 13. *Carphuroides anamalaicus*, ♂, antenna.
Fig. 14. „ *pectinatus*, Sharp, ♂ ; 14 *a*, posterior tarsus.
Fig. 15. „ *dentiger*, sp. n., ♂, antenna.
Fig. 16. *Carphurus muiri*, sp. n., ♂, elytra in profile.



MALAYAN AND INDIAN CARPHURINÆ.

II.—*Remarks upon the Skulls of* Mœritherium *and* Palæomastodon. By Dr. Branislav Petronievics.

[Plate II.]

There is in the British Museum a skull and mandible of *Mœritherium* not yet described, which is in several respects important for deciding the question of the ancestral relationship of *Mœritherium* to the Proboscidia. This skull was found by Baron Nopcsa several years ago (1905) in Middle Eocene beds in the Fayûm district of Egypt*. I propose to describe the features of this skull, which either give some supplementary data as to the morphology of the skull of the genus *Mœritherium* or are peculiar to the species. I propose also to give some additional evidence on the skull of *Palæomaston*. Finally, I will add a list of the resemblances and differences in the skull, mandible, and dentition of the two genera.

A. *Mœritherium*.

In the skull in question the basioccipital is separated from the basisphenoid by a suture situated somewhat obliquely on a ridge at the level of the glenoid surface. The suture between basioccipital and exoccipitals is not plain.

The exoccipitals with the condyles are as in *Mœritherium lyonsi*.

The same is to be said about the supraoccipital bone ; but the whole occipital plate in our specimen is directed backwards, while in *Mœritherium lyonsi* it is directed forwards, and the lateral depressions accompanying the median ridge are deeper in our specimen than in the old one.

The squamosal and its relation to the parietal and supraoccipital are the same as in *Mœritherium lyonsi*.

The jugal seems to be more slender than in the latter.

The tympanic in this specimen is better preserved than in the skull of *Mœritherium lyonsi*.

The parietals are as in the latter. It is uncertain if they meet the alisphenoids—probably not.

The frontals are as in *Mœritherium lyonsi*, with no post-

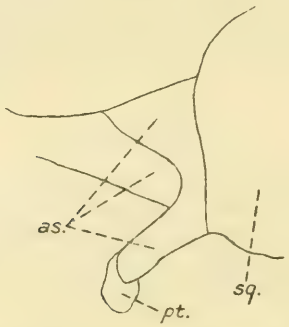
* Comp. C. W. Andrews, 'A Descriptive Catalogue of the Tertiary Vertebrata of the Fayûm, Egypt': London, 1906, p. 121 *seq.* (specimen M. 9225 in the British Museum).

orbital process. The exact relation of the frontals to alisphenoids and parietals is uncertain, but they reach the former.

The existence of a separate lachrymal cannot be established.

While in *Mœritherium lyonsi* the position of the alisphenoid on the side-wall of the skull could not be determined, in our specimen the limit of the alisphenoid in this respect is quite clear (text-fig. 1). Above the alisphenoid canal the alisphenoid forms a triangular bone. The backward side of this triangle is constituted by the suture separating the alisphenoid from the squamosal, while the upperside is marked by a suture separating the alisphenoid from the frontal (perhaps also from the parietal). It is to be remarked

Fig. 1.



Part of the left side of the skull of *Mœritherium ancestrale*, ½ nat. size. *as.*, alisphenoid; *pt.*, pterygoid; *sq.*, squamosal.

that the position of this part of the alisphenoid bone in our specimen is, perhaps, exactly the same as in *Palæomastodon*.

As the præmaxillæ are crushed in front, their relation to the nasals and maxillæ cannot be made out.

The maxillæ are very large and greatly elongated as in *Mœritherium lyonsi*; but, while in this latter there is only a small palatine vacuity between the slightly divergent anterior prolongations of the maxillæ, this vacuity is larger in our specimen, and the anterior prolongations of the maxillæ undoubtedly form part of the inner border of the sockets for the tusks, although they are somewhat crushed anteriorly. In this respect our specimen is nearer to *Palæomastodon* than any other species of *Mœritherium*. *Mœritherium gracile* has

these prolongations longer than *Mœritherium lyonsi*, but they do not reach the inner border of the tusks (comp. Andrews, *l. c.* pl. xvii. fig. 1).

The exact shape of the pterygoid is not to be established, but it is certain that its vertical plate projects beyond the end of the descending plate of the alisphenoid (fig. 1).

The upper teeth are so worn that their exact structure is not to be made out; but they seem to be the same as in *Mœritherium lyonsi*.

There are two main characters of our specimen which justify the supposition that it represents a distinct species:— (1) the elongated palatine vacuity between anterior maxillary prolongations forming the inner border of the sockets for the tusks; (2) the backward direction of the occipital plate. As the first of these two characters brings our specimen nearer to *Palæomastodon* than any other, we will give to the new species the name *Mœritherium ancestrale*, sp. n.

B. *Palæomastodon*.

The skull described by Andrews in his Catalogue as belonging to *Palæomastodon beadnelli* has been referred by him in a subsequent paper rightly to the smaller but much commoner species *Palæomastodon wintoni* *.

Only the left side of this skull has been figured by Andrews (*op. cit.* pl. xii. fig. 1); but, as the right side gives some additional evidence on the sutures of the bones, I add here a photograph of its right side (comp. Pl. II.).

The alisphenoid has been already described by Andrews (*op. cit.* p. 135 *seq.*). The suture separating this bone from the squamosal behind and from the frontal above is much clearer on the right than on the left side (comp. text-fig. 2, which corresponds to the photograph), as also is the suture separating the squamosal from the frontal.

The limit between orbitosphenoid and alisphenoid is not quite certain (text-fig. 2), but nevertheless clearer than on the left side, and the same holds good for the suture between the orbitosphenoid and frontal.

The small projecting part of the vertical plate of the pterygoid beyond the end of the descending plate of alisphenoid is also visible (text-fig. 2).

But the most important feature of the right side of this

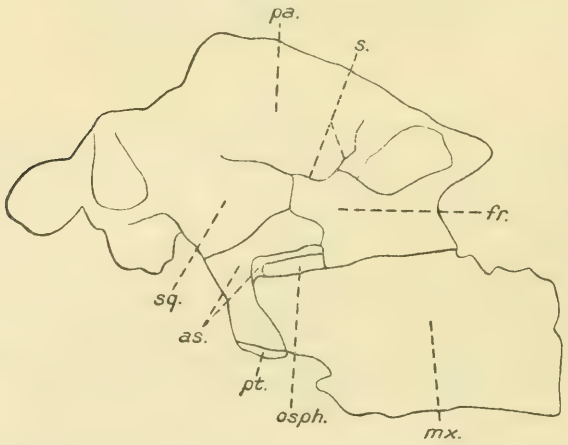
* Comp. C. W. Andrews, "On the Skull, Mandible, and Milk-dentition of *Palæomastodon*," Phil. Trans. 1908, p. 394.

skull is the presence of a part of the suture between the parietal and frontal (text-fig. 2), beginning from the squamosal and representing the lower portion of the whole suture. The upper continuation of this lower part of the suture is marked also in text-fig. 2, but is uncertain. On the contrary, the suture separating the parietal from the squamosal is more complete on the left than on the right side of the skull (comp. Andrews, *op. cit.* plate xii. fig. 1).

C. *Resemblances and Differences between* Mœritherium *and* Palæomastodon *in Skull, Mandible, and Dentition.*

The ancestry of *Mœritherium* to *Palæomastodon* has become very probable from the new additional features of

Fig. 2.



The right side of the skull of *Palæomastodon wintoni*, $\frac{1}{8}$ nat. size.

pa., parietal; *fr.*, frontal; *s.*, suture between parietal and frontal; *mx.*, maxillary; *osph.*, orbitosphenoid; *pt.*, pterygoid; *as.*, alisphenoid; *sq.*, squamosal.

the skull in the above-described specimen of *Mœritherium*. But, in order to make it possible to judge better on this question *, we give here a list of the resemblances and

* On this point three main opinions have been advanced:—(1) *Mœritherium* lies in the direct line of ancestry to the later Proboscidea; (2) *Mœritherium* is a primitive offshoot of the Proboscidean stock; and (3) *Mœritherium* is an offshoot of the Sirenian stock allied to Proboscidea. The first opinion has been maintained by Andrews in his first fundamental memoir on the question (comp. C. W. Andrews, "The Evolution

differences in the skull, mandible, and dentition of the two genera *, which are mainly founded on the characters of *Mœritherium ancestrale* on the one hand, and of *Palæomastodon wintoni* on the other.

(1) *Resemblances.*

1. The backward position of the anterior nares.
2. Anterior nares in front of the orbit.
3. The sagittal crest of the parietals.
4. Supratemporal ridges.
5. Triangular process of supraoccipital between parietals.
6. Median ridge on the occipital surface with lateral depressions.
7. Exoccipitals excluding supraoccipital from the foramen magnum.
8. Paroccipital process of exoccipital.
9. Post-tympanic process of squamosal.
10. Large portion of the squamosal on the occipital surface.
11. The relative position and the partial closure of the external auditory meatus.
12. Foramina in the squamosal bone above the auditory meatus.
13. Bones at the back of the skull thickened and contain air-chambers.
14. The shape of the basioccipital and basisphenoid.
15. The position of the suture (and transverse ridge) separating these two bones.
16. The position and the shape of alisphenoid on the side-walls of the skull.
17. The shape (?) and position of the pterygoid.
18. The position of the posterior opening of the alisphenoid canal.

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of the Proboscidea," in Phil. Trans. 1903, p. 101), but later on (comp. his Catalogue, Introduction, p. xvii) he was rather inclined to adopt the second view. The third opinion was expressed for the first time by H. F. Osborn (in his article "The Feeding-habits of *Mœritherium* and *Palæomastodon*," in 'Nature,' July 29, 1909), but abandoned (comp. his work 'The Age of Mammals,' 1910, p. 203 *seq.*) after the vigorous refutation of Andrews (in his article "The Systematic Position of *Mœritherium*," in 'Nature,' Sept. 9, 1909). In a recent paper, however, the eminent American palæontologist seems to have returned to his former wrong opinion on the subject (comp. H. F. Osborn, "*Palæomastodon*, the Ancestor of the Long-jawed Mastodons only," in Proc. Nat. Acad. Sci. vol. v. 1919, pp. 265–266).

* A similar but much shorter list is to be found in W. K. Gregory, 'The Orders of Mammals,' 1910, p. 367 *seq.*

19. The zygomatic process of the squamosal stout and strongly arched outwards.

20. The shape of the glenoid surface.

21. The backward process of the jugal and its relation to the glenoid surface.

22. Postorbital projection of the jugal as the posterior limit of the orbit.

23. A small tubercle on the lachrymal.

24. The position of antorbital foramen.

25. Posterior palatine foramina.

26. Divergent anterior prolongations of the maxillæ with anterior palatine vacuity.

27. Anterior palatine prolongations of the maxillæ forming the interior border of the alveoli of the tusks.

28. The long palate.

29. The angular portion of the mandible broad and rounded.

30. The spout-like anterior portion of the jaw.

31. I^2 enlarged and downwardly directed tusks.

32. I_2 large, tusk-like, and forming a prolongation of the spout-like anterior portion of the jaw.

33. The same number of premolars and molars in the maxilla.

34. The transversely ridged character of the molars.

35. M_3 with a large talon.

(2) *Differences.*

1. Præmaxillæ longer in *Palæomastodon* than in *Mœritherium*.

2. No suture between maxilla and nasal in *Palæomastodon* as in *Mœritherium*.

3. Nasal bones shorter in *Palæomastodon*.

4. Nasal opening much further back in *Palæomastodon*.

5. Cranial region of the skull longer in *Mœritherium* than in *Palæomastodon*.

6. Narrow supraorbital region in *Mœritherium*.

7. Postorbital prominences of the frontals developed in *Palæomastodon*, wanting in *Mœritherium*.

8. Triangular processes of the parietals on the occipital surface in *Mœritherium* (perhaps also in *Palæomastodon*).

9. Depressions on the occipital surface deeper in *Palæomastodon* than in *Mœritherium*.

10. The occipital plate directed forwards in *Palæomastodon*.

11. The condyles directed more *backwards* in *Palæomastodon* than in *Mœritherium*.

PHOTOGRAPH OF THE RIGHT SIDE OF THE SKULL OF PALÆOMASTODON WINTONI, ANDREWS. 1/5 nat. size.

12. There is no condylar foramen in *Palæomastodon* (doubtful in *Mœritherium*).

13. The basioccipitals forming lower ends of the occipital condyles in *Mœritherium* (perhaps also in *Palæomastodon*).

14. The air-chambers at the back of the skull much more developed in *Palæomastodon* than in *Mœritherium*.

15. Paroccipital process much smaller in *Palæomastodon* than in *Mœritherium*.

16. The zygomatic process of the squamosal not so strongly arched in *Palæomastodon* as in *Mœritherium*.

17. The jugal is proportionately more slender in *Palæomastodon* than in *Mœritherium*.

18. Lachrymal bone and lachrymal foramen doubtful in *Mœritherium*.

19. The basis cranii longer and situated far higher in *Palæomastodon* than in *Mœritherium*.

20. The palate longer and narrower in *Palæomastodon* than in *Mœritherium*.

21. The mandible longer and projecting in advance of the skull in *Palæomastodon*.

22. The horizontal ramus of the mandible stouter and its ascending ramus broader and directed more forwards in *Mœritherium* than in *Palæomastodon*.

23. The condyle of the mandible situated higher than its coronoid process in *Palæomastodon*.

24. No c, and i^2 and i_2 only in *Palæomastodon*.

25. The i^2 longer and laterally compressed in *Palæomastodon*.

26. i_2 directed forwards and meeting anteriorly in the middle line in *Palæomastodon*.

27. Pm^2 reduced, pm^3 and pm^4 showing the tendency to become molariform in *Palæomastodon*.

28. Only two premolars in the mandible of *Palæomastodon*.

29. Pm_3 reduced and simpler, pm_4 much more molariform in *Palæomastodon* than in *Mœritherium*.

30. Three-ridged molars in *Palæomastodon*, two-ridged in *Mœritherium*.

31. The last two molars enlarged in *Palæomastodon*.

In conclusion, I desire to express my thanks to Dr. Andrews, of the British Museum, for some very valuable help.

EXPLANATION OF PLATE II.

Photograph of the right side of the skull of *Palæomastodon wintoni*, Andrews, $\frac{1}{3}$ nat. size.

III.—*A new Species of* Amphioxus *from the Bazaruto Islands* (Branchiostoma bazarutense). By J. D. F. Gilchrist, M.A., D.Sc.

During the course of certain fishery investigations on the coast of Portuguese East Africa, three specimens of a species of *Amphioxus* (text-fig , p. 63) were found by Mr. H. A. T. Hunter in a clear sandy pool on the shores of the Bazaruto Islands.

These specimens measure in length 41·4, 42, and 34 mm. The body is rather elongate, its greatest depth being about eleven times in its length (of notochord). The distance between the anterior end of the notochord and the atrial pore is contained $1\frac{1}{2}$ times to $1\frac{2}{5}$ in the length of the notochord; the distance between the atriopore and anus from $4\frac{1}{2}$ to $4\frac{2}{5}$ times; between anus and end of notochord from 12 to $10\frac{1}{2}$ times. There are 38 to 42 myotomes in front of the atriopore, 15 to 17 between atriopore and anus, and 9 to 10 between anus and end of body, in all 62 to 69.

The fins are fairly well developed. There is a somewhat expanded cephalic fin running backwards into a rather low dorsal, whose greatest breadth is about $\frac{1}{11}\frac{1}{2}$ the depth of the body; it consists of about 340 ray-chambers, the last over the seventh or eighth segment from the posterior extremity of the body. The fin-rays are well developed, being, in the middle of the body, about $\frac{1}{3}$ the height of the chamber. The caudal fin is fairly well marked, and forms a continuous curve on both sides of the tail.

The preanal fin appears to be of special interest. It consists of many chambers and rays, about 62 in number. Near the anus, the two rows of rays are close together, but anteriorly they gradually diverge, till, near the atriopore, they are separated from each other by a space equal to about $\frac{1}{3}$ the breadth of the body in this region, and extend beyond the preanal fin to the metapleural folds. To ascertain this more definitely, and to determine the relation of the fin to the folds, transverse sections were made from the anal fin to the last (28th) pair of gonads. It was found that the fin, as it passes forwards, divides symmetrically into two parts, each of which is continuous with a metapleural fold. Similar sections passing through the fin and the beginning of the metapleural folds in *B. lanceolatum* and *B. capense* showed clearly that the preanal fin is not in these cases continuous with either of the metapleural folds.

The symmetrical continuity of the preanal fin with the

C. von Bonde del.

Branchiostoma bazantense, sp. n.

metapleural folds lends support to the supposition that this fin arises as a fusion of the folds, and that the asymmetrical condition of some species, in which one metapleural fold only is continuous with the preanal fin, is a secondary one.

In a recent revision of the Lancelets, Hubbs ('Occasional Papers, Museum of Zoology,' 1922) has drawn attention to certain characters, chiefly the number of ray-chambers, which seem to throw some light on the synonymy of the closely related species of *Branchiostoma*. Thus, on the basis of the number of chambers in the preanal fin, *B. bermudæ* and *B. platæ* are distinguished by the small number, while *B. elongatum*, *B. capense*, and *B. lazarutense* are distinguished from all other by the increased number of such chambers.

On the older diagnostic basis of classification by the number of myotomes, this new species is distinguished from *B. capense* and *B. elongatum* by the lesser number of preatrioporal myotomes, which are about 10 fewer. From *B. capense* it is further distinguished by the presence of an eye-spot, which is absent in all the specimens of this species examined.

The increased number of myotomes of *B. capense*, which has been found from False Bay to Algoa Bay (Agulhas current), as compared with *B. lazarutense*, found in the warmer waters of the East Coast (Mozambique current), may have some general significance, especially as the same relation obtains between *B. elongatum*, found from Valparaiso Bay to Galapagos on the West Coast of S. America (Peru current), and *B. platæ*, found off the mouth of Rio de la Plata in the warm waters of the East Coast.

Following up the Brazil current into the Equatorial current, we find, on the East Coast of America, species with a reduced number of myotomes: *B. virginiæ* (Carolina) with 62, *B. floridæ* (Florida) with 59, *B. carribæum* (Antilles), and *B. bermudæ* (Bermuda) with 55. *B. belcheri* of the warmer waters of the Indo-Asiatic region has also a reduced number (64).

B. californiense has an increased number, and this may be associated with the Californian current, an offshoot of the cold West-wind drift. The European *B. lanceolatum*, with a reduced number of myotomes, is associated with the warmer waters of the Gulf Stream.

There remains, however, a species of *Branchiostoma* from Ceylon, *B. tattersalli*, Hubbs, which does not seem to conform to this principle. The myotome formula of this

species is 40+20+12=72, which is close to that of *B. californiense* and *B. capense*, and very different from that of the species of the warm waters of the East Coast of America, though also in the warm Equatorial currents, and in about the same latitude. There are, however, some peculiarities about this species, for, according to the number of pre-atrioporal myotomes, it falls readily under the warm-water species, the total high number being made up by the preanal myotomes, which are 20, which is more than in any other species.

The following table, showing the average number of myotomes and ray-chambers (to the nearest whole number) of the different species, arranged according to the total number of myotomes, may be useful :—

Species.	Number of myotomes.				Ray-chambers.	
	Pre-atrio-poral.	Pre-anal.	Post-anal.	Total.	Dorsal.	Pre-anal.
B. bermudæ, Hubbs	35	13	7	55	180	20
B. carribæum, Sundevall	32	13	9	54	229	34
B. floridæ, Hubbs	34	15	8	57	292	42
B. lanceolatum, Pallas	36	14	11	61	231	42
B. virginiæ, Hubbs	38	15	10	63	264	38
B. platæ, Hubbs	39	14	10	63	305	25
B. bazarutense, Gilchrist	40	16	9	65	340	62
B. belcheri, Gray	37	14	13	64	—	—
B. tattersalli, Hubbs	40	20	12	72	—	—
B. californiense, Andrews	46	17	9	72	343	50
B. capense, Gilchrist	47	18	9	74	353	62
B. elongatum, Sundevall	49	18	12	79	many.	70

IV.—*Notes from the Gatty Marine Laboratory, St. Andrews.* —No. XLV. By Prof. M'Intosh, M.D., LL.D., D.Sc., F.R.S., &c.

[Plates III. & IV.]

1. On certain Features in the British Species of *Lepadogaster*.
2. On the Rarity of Abnormality in the Incisors of the Wild Rabbit, and on its Coloration.
3. On the Fragmentary Skull of the Airthrey Whale in the Royal Scottish Museum, and Remarks on Humpback, Blue, and Finner Whales.
4. On a Fragmentary Skull of *Balæna australis*, Desmoulins, in the British Museum.
5. On *Amphinome rostrata*, Pallas, in the Atlantic and Indian Oceans.

1. *On certain Features in the British Species of* Lepadogaster *.

At least four species of *Lepadogaster* occur in British

* I am indebted to Sir Sidney Harmer and Mr. Norman, of the British Museum, for the opportunity of examining good examples of the four British species of *Lepadogaster*.

waters, the majority (as regards numbers) frequenting the warmer southern areas. They are:—*L. gouani*, Lacépède, generally distinguished in the adult condition by its larger size, by its long nasal tubes, by the junction of the dorsal and anal fins with the caudal, and, as the late able Prof. Guitel has shown, by the presence of *tubuli contorti* in the kidney. *L. candollii*, Risso, in which the rays in the dorsal and anal range from 14–16 (9–11, *Moreau*), and, though coming close to, are yet separated from the caudal. There are no *tubuli contorti* in the kidney (*Guitel*). Both this and the foregoing are shore-forms, and at Guernsey the first-named is often found at the breeding-season inside the hollow bases of *Laminaria saccharina* in the vicinity of its eggs. The third form is the widely distributed *L. bimaculatus*, Fleming, a smaller species, which generally frequents deeper water, though it is not uncommon in the laminarian region at Lochmaddy, North Uist, and in the comparatively shallow water of St. Andrews Bay. Moreover, both in Guernsey and Plymouth it has occurred at low water in the former with *L. gouani* in the cavities of the tangles amongst the ova, and at the latter under a large stone with several examples of *L. gouani* in Wembury Bay. The young forms range to the Atlantic, Jura, Gairloch, Smith Bank, and various parts of the Moray Firth, and occur in the stomach of the cod. One of the finest examples (48 mm.) comes from Loch Scridan (*Anderson Smith*). Its dorsal and anal fins are distinctly separated from the caudal, the former having 5–7 rays and the latter 4–6 rays. There are no *tubuli contorti* in the kidney. The fourth species was added to the British fauna and to science by that acute observer, George Brook, in 1889 *—probably during investigations conducted on the West Coast, where the Fishery Board for Scotland had then a temporary Marine Laboratory. Several writers, including the Author, had not differentiated the species from *L. bimaculatus*, so that the literature on the subject requires revision. Thus the writer described and figured the perianal papillæ and suckers of the sexes in the 14th Report of the Fishery Board for Scotland † in 1894 as those of *L. bimaculatus*, whereas they are characteristic of *L. microcephalus*. Prof. Guitel, who did such excellent work in the genus, published finely coloured figures of both sexes in *L. bimaculatus* and *L. microcephalus*.

* Proceed. R. Phys. Soc. Edin., Session 1888–9.

† 14th Ann. Rept. p. 178, pl. v. figs. 5 & 6. *Vide* also Ann. & Mag. Nat. Hist. (6) vol. xix. p. 252.

The chief characters given by Brook and Guitel of *L. microcephalus*, Brook, are as follows :—The snout is as large at the extremity as at the base, which really means that the anterior curve is broader than in its nearest ally, *L. bimaculatus*, and in contrast with the sharper snouts of *L. candollii* and *L. gouani*. The tail is about one-sixth the length of the body. It is also thicker and more fan-shaped than in *L. bimaculatus*, so that in spirit-specimens the tails of the latter have a tendency to be pointed posteriorly. The first ray of the anal is beneath or in front of the second of the dorsal. The space between the vent and the anal fin is less than in *L. bimaculatus*, viz., 0·40–0·85, whereas in the latter it is 1·25–1·75 (*Guitel*). The shortness of the head and the lateral bulge of the muscular cheeks are characteristic. A superior canine and sometimes an inferior. Vertebræ 29–32. Kidneys without *tubuli contorti*. Dorsal fin 5–7 rays, anal 5–7, often 5 in each; pectoral 20–24; caudal 18–22, generally fewer. A prominent nasal tube * in front of the eyes. Perianal papillæ large and flattened, or long and lobate. A touch of green or maroon at the origin of the dorsal and anal fins; in the adult a large purple or black touch in these fins and touches of purple on the throat at sexual maturity. In the female and young male the cheeks are flattened and with a dorso-ventral groove. No nasal tube; no canines. Dorsal and anal fins without pigment, and so with the throat. Colour greenish or maroon. In general aspect it differs from *L. bimaculatus*, were it only for the texture of the fins. It is interesting that the young of both *L. bimaculatus* and *L. microcephalus* are pelagic and captured at considerable distances from the shore, and, whilst the former has its habitat in the adult state in deep water, the latter occurs in the laminarian region and between tide-marks. The ways of Nature in regard to the young of these forms affords a contrast—for instance, to those of the young of the cod and the haddock, the former seeking the rocky margins when about an inch in length, but the latter keeping to deep water till about 5 inches in length.

A few notes are also made for comparison on a fifth species, *L. wildenowi*, Risso, from the coast of Nice, and probably from other parts of the Mediterranean, but which

* In the adult *L. microcephalus*, as in *L. candollii*, the nasal tubes are comparatively short, the anterior being the longer. In *L. bimaculatus* both are somewhat shorter, whilst in *L. gouani* the long processes at the anterior aperture are diagnostic.

has not yet been found in British waters. It is distinguished by its smaller size, by the well-marked notch on each side of the short blunt snout, by a less distinct notch opposite the small eyes, by the junction of the dorsal and anal fins with the tail, and by other structural features noted elsewhere. Whether the forms kindly sent from the British Museum are mature is an open question, but they appear to be so.

The sucker in the female of *L. bimaculatus* has its anterior border provided with fine fimbriæ, and a short distance behind is an opaque curved belt, which does not, however, form a free edge. The massive central region is indistinctly divided into two parts, though the anterior pair (forming the quadrants) are present, the complete area being irregularly circular from the flattening of the posterior border, whilst the wings at the sides end in a thin but entire membrane between the rays.

The posterior region forms a blunt wedge, its anterior border being free (resting on the posterior edge of the thick central mass in front). A little behind the two rounded areas a series of rays pass backward to the thickened rim, which is not separable to any extent from the surface, whilst posterior to this is the diaphanous membranous border, the folds of which appear to have only small independent crenations at the edge.

In the male the apparatus is proportionally larger. The anterior border has similar fine fimbriæ or papillæ, and the region behind is tessellated by flattened papillæ. The massive sucker in the centre is more distinctly bilobed. The lateral wings have only the thin membranous edge devoid of papillæ, though the rays make prominences throughout. The wedge-shaped posterior area has its thick anterior region more distinctly bilobed, followed by the two circular areas behind, whilst the radii pass to the thickened ridge as in the female. The posterior membranous frill has also the same structural features.

The sucker in *L. candollii* appears to approach that of *L. bimaculatus* most nearly, but the fimbriæ along the anterior border extend much further backward on each side, embracing indeed almost the entire edge of the lateral wing. The anterior sucker forms a circle divided into quadrants, and the whole area in front and that of the wings (ventral aspect) is dotted with minute papillæ. There is a tendency also for the marginal papillæ to pass inward along the ends of the rays. The basibranchial region forms a sharper double cone than in either *L. bimaculatus* or *L. microcephalus*.

In *L. gouani*, Lacépède, the sucker diverges considerably from that in the other species, since much of the area anteriorly and posteriorly is tessellated by the large flat papillæ. The anterior margin has large flattened free papillæ as far as the commencement of the wings, and thereafter the margin is smooth or with broad crenations in the female (on one side). The anterior sucker has the two front quadrants indistinct. The posterior sucker presents three depressions anteriorly in some large males, and the marginal frill has its rays all united by a continuous web, short portions of the tips only being free, but variation occurs, for in another example the thickened margin of the papillose region in front of the marginal membrane was studded with short papillæ, and the outer frill was distinctly papillose. To a less degree the same was found in a female. In another well-preserved female the frills began at the sides of the posterior sucker with large though flat papillæ, and ran into the posterior frill with its longer papillæ. The size of the surface-papillæ is a feature of this species.

The horseshoe-shaped anterior region of the sucker in *L. microcephalus* *, Brook, has its margin in the male densely fringed with papillæ to the bases of the wings, and the edges of two of the posterior rays are likewise papillose. The anterior quadrants of the sucker of the region are indistinct, but the posterior are boldly marked, and most of the surface of the region is furnished with small flattened papillæ. The median part of the posterior sucker is separated from the lateral by a furrow on each side, and the thickened rim within the border is minutely papillose, whilst the marginal frill is cut distally into distinct small papillæ, and commences about the middle of the lateral edge. The marginal frill itself is regularly striated by fibres. The arrangement of the papillæ on the anterior margin in the female is the same, but the papillæ appear to be more dense along the outer rim as well as on the posterior rays. The membranes and papillæ of the sucker in this species agree with the fins in being stiffer than in the other forms.

Guitel † has made some observations on the condition of the sucker in young examples 8·47 and 9·24 mm. In the former and youngest example the length of the sucker is 0·93 mm., and the junction between the last ray of the ventral and the pectoral is absent. The "little pectoral" is

* Dr. Allen kindly sent various examples from Wembury Bay, Plymouth, where they occurred under stones at the margin of low spring-tides.

† *Op. cit.*

indistinct. The transverse line which unites the last rays of the ventral leaves the cranial side about the seventh, and forms the anterior border of the posterior sucker. No trace of the posterior border of the posterior sucker with its pseudo-rays is seen, nor is there any sign of the flat epithelial papillæ. The face of the posterior sucker is convex from left to right, but slightly concave antero-posteriorly. Nevertheless, by artificial coloration the several areas of the sucker are clearly seen. The two areas correspond in outline with the post-claviculars, which support the posterior sucker. Osseous rays are visible in neither example, but the articulations are distinct in the three anterior rays. In the areas of both dorsal and anal fins traces of rays occur. The ventrals are entirely independent of the pectorals. It is probable that the posterior sucker is functional. At a later stage (Guitel's *stade moyen*), measuring 9·94 mm., considerable advances have been made. Briefly, the junction between the posterior ray of the ventral and the first abdominal of the pectoral has been completed; the "little pectorals" approach the adult state, the posterior fringe of the rear sucker is still incomplete, and there are fewer rows of flat papillæ. At 12·20 and 12·24 mm. the sucker presents all the essential characters of the adult organ.

In the male *L. wildenowi*, Risso, the sucker considerably diverges from those of the foregoing species, since the anterior border is separated from the rest by a notch on each side, and instead of papillæ presents only a few smooth crenations on its thickened tissue. Behind the notch the wings (four rays) are thickened by large irregular papillæ—so different from the tessellated aspect of the other forms. The thickened edge is only faintly crenated until it runs into the pectoral rays, a prominent point or two marking the junction. Only two of the quadrants are distinct, the anterior pair being merged in the tissues. The posterior sucker forms a blunt wedge, the narrow end being anterior, and its surface is studded with large flattened papillæ of varying sizes, but somewhat regularly arranged, two antero-posterior lines bounding a central space in front, and two rows of papillæ enclosing it behind. The edges of the sucker are comparatively smooth anteriorly and laterally, whilst the posterior border is minutely serrated. The structure of the apparatus in a female (not so well preserved) appears to be similar, though the posterior sucker is considerably less, and presents two symmetrical hollows posteriorly, and two small bosses in front of them, whilst

the anterior sucker has two small bosses, representing the quadrants, a process from the base of the pectoral rays slanting symmetrically behind these.

One feature, perhaps, has not been sufficiently emphasised in the four species, viz., the condition of the anus. In *L. bimaculatus* the orifice is surrounded by a series of radiating striæ, but which in neither sex are split into papillæ, though the edge of the aperture is minutely crenate, whilst in the large male and the smaller female the urino-genital papillæ stand out prominently behind. There is a tendency for the perianal fold to be continued beyond the urino-genital papilla, but no evident papillæ occur behind the latter.

The condition of the vent in *L. wildenowi*, Risso, appears to approach that in *L. bimaculatus*, though the marginal crenations, in proportion to the size of the fish, are more distinct.

The next stage is seen in *L. candollii*, in which the margin of the anus in both sexes is distinctly papillose, the papillæ extending backward and more or less ensheathing the urino-genital papilla. The perianal papillæ are not large, but they are more distinct than in *L. bimaculatus*, though the examples are somewhat softened.

In *L. gouani* the tapering long papillæ, about 18 in number, form a fringe to the vent and extend backward to the sides of the urino-genital papilla, but not behind it, the furrow behind having smooth edges. The papillæ taper from base to apex.

In none of the foregoing are the perianal papillæ so boldly developed as in *L. microcephalus*, Brook. In the male they form a series of about nine lobate papillæ round the vent, the most posterior on each side being joined to its opposite neighbour by a band of skin, and in shape these are more flattened and broader than the rest. There is no appreciable groove behind the genito-urinary papilla. In the female these lobate papillæ are longer and more prominent, whilst some of the posterior have a flattened lamella at the base. They extend to the genito-urinary papilla, but do not go behind it, though from their length they envelop it. A faint groove is indicated immediately behind the latter, but it is much less than in such as *L. gouani*. The number of the perianal papillæ appears to be nine, one or two forming junctions with their neighbours.

In distinguishing the young *L. bimaculatus* from the young *L. microcephalus*, Guitel observes that in an individual of the former—measuring 12·20 mm.—the first ray of the anal is

situated below the third inter-radial membrane of the dorsal. In the latter it corresponds with the third dorsal ray. The interanal space is 1·38 to 1·40, whereas in *L. microcephalus* it is 1·25 to 1·38 mm. The muzzle is not elongated as in the young of the latter. In the same species the body is elongated behind the pectorals; the interocular space is large, though the ocular globe is small; the skin is thickened over the dorsal and anal, and the rays of both fins are thick, and, it may be added, so are those of the pectorals.

By the courtesy of Prof. D'Arcy Thompson and Dr. Bowman, a series of young Lepadogasters obtained during the cruises of the Fishery Board's research-steamer were forwarded for examination. The wide area from which these were obtained stretched from Kinnaird Head to Cape Wrath, and thence to the western waters of Lewis. No doubt they extended to the south and east of the Outer Hebrides and elsewhere, since the adult forms are known to have an extensive distribution. The smallest of these measure a little over 4 mm. and were procured by a 1-metre cheese-cloth net five miles east of the Butt of Lewis, and again about seven miles S.S.E. of the Flannan Islands, west of Lewis—the former in a horizontal haul at 70 metres' depth, 22nd July, 1922, the latter also in a horizontal haul at 68 metres the same month. Such could not have been long hatched—perhaps a week or ten days. The snout is blunt, the head rounded, the mandible when closed slightly inclined upward, the marginal fin is continuous to the vent, only embryonic rays are present, and the notochord is straight. A band of black pigment runs obliquely inward and backward from the hind edge of the eye to join the dorsal specks, whilst the sides from the pectorals to the caudal are covered by more or less longitudinal rows of black pigment-spots. Ventrally two short bars of black pigment are in front of the pectorals, the median line behind being pale and bounded by a row of black specks on each side. The pectorals stand boldy out as separate fins on each side with a muscular base, but only embryonic rays are present.

Of this size there were about half a dozen out of fifteen specimens from the Flannan Islands, showing that there had been many at this pelagic stage. At 6 mm. the notochord is very slightly inclined dorsally and considerable opacity occurs in the hypural region from the development of true rays. The caudal has still only embryonic rays. Pigment occurs between the bases of the pectorals in the form of a few black specks, and a thickening of the tissues is visible.

The marginal fin commences far forward dorsally—almost a third from the snout,—and ventrally terminates at the anus, only embryonic rays appearing, with the exception above mentioned. The black pigment along the sides of the body remains much as before, the median line dorsally and ventrally being free. The rows of pigment are somewhat irregular, though four are present and other two over the region of the gut. A black streak occurs on each side of the mandible posteriorly.

At 8 mm. four rows of pigment-spots are present on the body and two on the region of the gut, whilst the pectoral shows a curved row at its base, stopping short of the mid-ventral line; and those on the mandible are distinct, with a few chromatophores in the centre between them. The dorsal marginal fin commences about a third behind the tip of the snout, and runs to the vent, and the hypural elements have made further progress. The notochord is little bent up, and the muscular sheath has extended backward so as to reduce its free part. Two oval areas are distinct between the anterior edges of the pectorals—which with the thickened region behind indicate the development of the sucker. The pectorals have fan-shaped muscular bases and about nineteen true rays are developing at 9 mm., but there is no sign of ventral extension of the fin. At 9 mm. the head is larger, the eyes prominent, the nasal pits more evident, the upward slope of the mandible less, and its breadth somewhat greater, whilst the rapid development of the hypural elements has pushed the tip of the notochord boldly upward, the enveloping tissues below forming a nearly straight line with a deep notch in the middle, the body as a whole appearing to be shorter and thicker. The marginal fin shows only embryonic rays. Little change has occurred in the lateral pigment, though the specks are disappearing from the throat. The vent is distant from the tip of the tail about a third the total length of the body. The development of the anterior part of the sucker has brought it in touch with the lower edge of the pectorals, and two ovoid areas have been formed there; whilst behind, the fan-shaped posterior sucker has been outlined with a smooth free edge posteriorly.

The next stage is almost 10 mm., the body having notably increased in bulk rather than in length, the depth and thickness especially being noteworthy. The broad head has increased its area in front dorsally. Only a trace of pigment occurs behind the eyes, the ventral surface is pale throughout, whilst the rows of black spots along the sides

are somewhat faint and have almost disappeared from the region over the gut. The tip of the notochord has shrunk to a small process at the upper border of the strong caudal rays, which form a proportionately large ovoid fan in which fourteen distinct true rays can be seen, and probably others developing. No cartilaginous elements can be made out in the dorsal and anal, though thickenings appear to be present amongst the embryonic rays. The anus is less prominent than in the younger stages. The lower edges of the pectorals are firmly united to the anterior sucker, which shows two of the quadrants of the adult organ, whilst the posterior division is considerably larger—of a broad wedge-shape—and the free edge behind is apparently smooth.

Two older examples come from Dornoch Frith, close to Tarbat Ness, on the 18th October, having been captured in the Petersen Young Fish Trawl*. In lateral view they resemble wrasses—from the deep thick body and downward slant of the outline of the head to the snout. The notochord has now disappeared from the upper part of the caudal rays, which are twenty-two in number, and the median, on each side of the caudal notch at the base, are strong. The dorsal shows four distinct true rays and traces of a fifth behind, the post-larval continuation toward the head in the previous stages being membranous. The anal presents at its anterior region four rays, both it and the dorsal being still continuous with the tail by the larval fin. In the slightly longer example the caudal rays seem to be fewer, only sixteen being actually made out, but the tail had been injured, five true rays being in the dorsal and five in the anal.

Guitel†, in 1916, had an opportunity of examining the young of *Lepadogaster microcephalus*, procured by the Danish ship 'Thor' under the care of Dr. Johs. Schmidt. They were obtained in February, June, and September. His youngest stages measured from 8·47 to 9·52 mm. In these the first ray of the anal was opposite the third interradial membrane of the dorsal. The diameter of the eye was smaller than in *L. bimaculatus* of the same size, whilst only in one example was the space between them greater than in the latter species. The chromatophores gave the body a mahogany tint. The larval fin was continuous with the dorsal, caudal, and anal. There is no interanal space.

* Perhaps an equally effective young fish trawl had been used at St. Andrews more than twenty years before Dr. Petersen's came into action.

† Arch. Zool. Expér. tom. 56. no. 1.

There were only traces of the rays in the dorsal and anal. Rays, however, were present (*fide* his fig. 3) in the caudal below the bent-up notochord (urostyle). The squat snout was rounded; the digestive tube straight. In Guitel's middle stages from 9·40 to 12·20 mm., the larval fin is still present. In two individuals the first ray of the anal corresponded with the second inter-radial membrane of the dorsal, whilst in three the first ray of the anal corresponded with the third of the dorsal. The other examples varied in this respect. As regards the size of the eyes and the inter-orbital space, they agreed with the younger stages, and so with the pigment. The pectorals, dorsal, and anal fins now had rays. The anus divides the body into two unequal portions, three-fifths being in front, and two-fifths behind it, whereas in the adults of this species and *L. bimaculatus* the anus is about the middle of the body. The anal fin commences immediately behind the anus.

The articulations of the rays are made distinct only by the action of the hæmatoxylin. In the young of *L. bimaculatus*, on the other hand, these rays possess the characters of the adult. The snout is a little longer, though still squat, and rounded, the height of the body greater, and the urostyle more or less hidden. The most advanced specimens measure from 12·20 to 12·24 mm. The form of the body resembles that of the adult. They correspond with the adult in the length of the body behind the pectorals, the relative size of the eye, and the wide interorbital spaces, in the thickness of the skin covering the fins, and in the thickness of their rays. On the other hand, they agree with *L. bimaculatus* in that the first ray of the anal is situated opposite the third inter-radial membrane of the dorsal, or opposite the third ray of the dorsal. The snout, which in the adult *L. microcephalus* is elongated, is short and rounded at the base, thus resembling the young of *L. bimaculatus*.

2. *On the Rarity of Abnormality in the Incisors of the Wild Rabbit, and on its Coloration.*

For many years on the East Lomond and elsewhere in Fife, in Forfarshire on the Sidlaws, and in Perthshire, thousands of the skulls of the wild rabbit have come under notice, and in only one instance, where the whole osseous system was abnormal, has any deviation from the normal type of incisors been found. The upper and lower incisors have invariably kept true to the type, and, indeed, the same

may be said of the premolars and molars. In a state of nature and in favourable surroundings, variation, with the single exception mentioned, has never been encountered. I had hoped to study the rare example of the abnormal wild rabbit which had been mounted and placed in the University Museum, St. Andrews, but unfortunately it cannot now be found. It was dead when obtained in an old quarry (Old Red Sandstone) at Nevay.

There can be no doubt that the general coloration of the rabbit is well adapted, as a rule, for its safety. The colour of the hairy coat also presents little tendency to vary, though black and albino rabbits occasionally are bred by the normal wild form, and it is curious that in the black forms the hairy pads on the under surface of the toes correspond in colour with those of the normal type, and so with the albinos. In former years (1901–2), one or two examples with tufts of longer silky hairs were encountered on part of the Sidlaw range (930 feet), but they have long since disappeared. Occasionally a rabbit is found with a large saddle-like patch of darker hue on the dorsum (rump), and the keepers attribute this to the scraping of a ferret, since the rabbit when cornered exposes its least vulnerable region ; but it is doubtful if all the saddle-like patches are thus caused. It is curious that an elongated brown patch occurs on the inner aspect of the flank in a position where it can be of no service for protection, the under surface being white. Moreover, the white tail, as has been often pointed out, may be a warning colour for its neighbours, but, even in the dark, it makes a ready mark for a gun. In the fifties of last century, a curious variety abounded above high-water mark on the island of Cumbrae, all the representatives of which had a white ring round the neck, whilst normally coloured in other parts. It is possible that there are other varieties elsewhere which retain their peculiarities of coloration.

3. *On the Fragmentary Skull of the Airthrey Whale in the Royal Scottish Museum, and Remarks on Humpback, Blue, and Finner Whales.*

When examining the small finner or piked whale some years ago, Dr. Eagle Clarke drew attention to a sub-fossil occiput and neighbouring parts which had been found at Airthrey, near Stirling, in the area of the Forth, and which the late Sir William Turner had connected with *Balænoptera physalus*, L. (olim *musculus*), but which he (Dr. Eagle

Clarke) thought to be different. Accordingly, as soon as opportunity offered, an examination of the specimen and comparisons with various types were made. Dr. Ritchie kindly aided me with photographs of the sub-fossil form, whilst Sir Sidney Harmer and Mr. Pycraft spared no pains in supplying photographs and in affording free access to examples in the British Museum.

The Airthrey skull was unearthed in July 1819, and a short account of the locality of the bones found with the skull was given by Mr. Robert Bald * the same year. He describes the bones as lying in a fairly regular position, and they consisted of the cranium, vertebræ, ribs, jaw-bones, bones of the "swimming paws" and of the ear. He estimated the length at 72 feet, but this is probably underestimated.

The fragment in the Museum (Pl. III. figs. 1–3) consists of the occipital and part of the temporal arch of a large whale, and measures, from the anterior suture of the supraoccipital to the front of the *foramen magnum*, 3 feet 4½ inches, whilst the breadth across the posterior region, between the temporo-squamosal eminences, is 4 feet 10 inches. The temporal arches are incomplete, but from point to point, as shown in fig. 1, the distance is 8 feet †.

The anterior suture of the supraoccipital is very slightly convex forward, forming a flat arch measuring along the curve 1 foot 7 inches, whilst in a straight line it is 1 foot 6 inches, and is boldly serrated, the surface just behind the suture being slightly convex, though much less so than in the right whale. The lateral margins have similar curvatures to those of *Balænoptera physalus* (olim *musculus*), though the whole structure, including the temporal arch, is more massive.

Behind the anterior suture the surface of the bone is slightly concave, and a median ridge passes backward from a point about 8 inches behind the anterior edge to a point about a foot in front of the *foramen magnum*. No distinct lateral ridges are present as in some examples of *B. physalus* (Anatomical Museum), but, as observed in the figure, there are bony granules between the lateral border and the median line, and in the lateral expanse is a rough bony eminence from which a low ridge on each side slopes inward to the *foramen magnum*. From the raised lateral tubercles a slight

* Edinb. Philos. Journ. vol. i. p. 393 (1819).

† These measurements differ from those of Sir William Turner, who states that it is 9 feet 2 inches long and 4 feet 6 inches broad.

ridge is continued forward for some distance a few inches within the edge of the bone. Outside this is another ridge close to the margin. The general surface of the supra-occipital in front is roughened by small bony tubercles, all these features being well shown in the photograph (fig. 1). Anteriorly the frontals at each side go forward as long ridges, which expand as they go. The occipital condyles are somewhat flat, narrowed above, broad in the middle, and narrowed again below. The long diameter of the *foramen magnum* is antero-posterior, and a deep sulcus occurs inferiorly between the condyles. The bony tissue is thinner at the upper arch of the aperture than at the lower. In lateral view (Pl. III. fig. 2) the curve of the supraoccipital forms a bold arch dorsally. The condyles with the *foramen magnum* project posteriorly in the position shown in fig. 1 about 6 inches—by a gradual rise from the surface. The temporal arcade is separated from the occipital externally by a prominent ridge, since the edge of the occipital is on a higher level. The massive temporo-squamosal is a notable feature, and, looking from above, there is an incurvation beyond the occipital border posteriorly. The suture between the frontal and temporal is very distinct and quite normal, and the upper border forms a thickened rim to the edge and runs forward to the anterior frontal processes.

In examining the occiput of the whalebone whales, three main types are apparent in the skeleton of the region: (1) that of the right whales, (2) that of the finners, (3) that of the humpbacks.

In the right whale (*Balæna mysticetus*) the anterior border of the supraoccipital is smoothly rounded—more or less semicircular, and the region behind is convex. This convexity is marked from birth onward, as observed in the young example in the Royal College of Surgeons Museum * in Lincoln's Inn Fields, as well in the adult forms there and elsewhere. The basioccipital and the basisphenoid form, when viewed from the rear or from below, a high arch, increased by the projecting exoccipitals and the great articular processes of the zygomatic arch. Whilst no definite ridge is seen dorsally in *B. mysticetus*, a short and slight ridge occurs in a large *B. australis* from Lochend, Shetland, 5 or 6 inches in front of the *foramen magnum*. The upper edge of the latter is thin, the lower thick, a condition which seems to be general in the whalebone whales. The diameter

* I have to thank Sir Arthur Keith for all his kind courtesy in this Museum, and also Mr. R. H. Burne, his assistant, for measurements of the nasals.

of the aperture, antero-posteriorly and transversely, in John Hunter's example, the skull of which is 9 feet 6 inches in breadth, is about 5 inches, and is somewhat larger than in the more recent specimen in the basement (4½ inches), but both are almost circular. The condyles are broadly elliptical, a wide sulcus between them being caused by the *foramen* in front, but there is only a deep and narrow one inferiorly. Behind the convexity of the supraoccipital the middle line goes nearly straight backward to the *foramen magnum*, and from this line the surface rises to the prominent external border, which has a thick boss at the upper junction of the temporal with the parietal, the latter forming, as it were, a long channel or gutter from the lower edge of the temporal fossa or passage to end in an angle about a foot from a transverse line drawn from the anterior convexity of the supraoccipital. Posteriorly the bone rises from the condyles to the ridge, where it is joined by the temporo-squamosal. The hollow next the condyle has inferiorly the boss of the exoccipital.

The parts composing the temporal fossa or passage differ from those in *Balænoptera* and *Megaptera*. The frontal bar projects outward like a great pillar, and is so deeply yet smoothly notched as to be bifid at the extremity, as it forms the roof and anterior segment of the orbit, which, instead of looking straight out, is placed obliquely forward, the rest of the rim being completed by a small segment of the maxilla antero-inferiorly and the jugal inferiorly. The frontal sends a bar about 10 inches long over the base of each nasal, the length of which is 1 foot ¾ inch, and these bones are bevelled in front, somewhat after the manner of those in the blue whale. Sir William Flower pointed out in his paper on the whales in continental Museums that the nasals of *Balæna mysticetus* differed in breadth from those of *B. australis*, and this is well illustrated in John Hunter's large right whale, as well as in another large example in the Museum of the Royal College of Surgeons, where the breadth across the nasals is respectively 7¾ inches, and in the other about 6¼ inches, whereas in large examples of *Balæna australis* in the British Museum the breadth across the nasals ranges from 8¾ to 14 inches. The temporal passage is widest internally, narrow towards the orbit. In lateral view the temporo-squamosal shows an obliquely flattened upper surface sloping to the orbit, whilst the articular process for the mandible passes obliquely behind it. A high ridge marks the junction of the occipital with the temporo-squamosal. The huge oblique mass has on its inner

and ventral surface the concave articular surface for the condyle of the mandible, thus accounting for the marked inward bulge. No feature, indeed, is more diagnostic of the Balænoid whales than this articulation on a more or less horizontal surface, great space being obtained by the downward prolongation of the massive process of the temporo-squamosal, whereas in the other two groups the condyle of the mandible plays against a surface more or less vertical, and the space at the back part of the mouth is less. When, for instance, the occipital region of *Balæna australis* is placed on its dorsal surface, the massive, pillar-like, articular processes of the temporo-squamosal project upward in a characteristic way, though, perhaps, the articular surface is less horizontal than in *Balæna mysticetus*. In lateral view the oblique position of the zygomatic arch is marked.

The premaxillary, which touches the frontal at the side of its two nasal processes, leaves the frontal edge as a narrow bar about 4 inches across, widens at the blow-holes, forming a thick smooth edge on each side. On the ventral surface the narrow and thin belt of the maxillary, from its outward curve at the nasal region to the orbit, is diagnostic when compared with the homologous broad plate in *Balænoptera physalus*—which covers most of the ventral surface of the expanded frontal.

Inferiorly the pterygoids with the hamuli form flattened plates about 8 inches across, the inner edge projecting toward the posterior nares, and separated from each other by a space of 10 inches, whilst their outer border abuts on the air-space above and external, and makes a suture with a process of the squamosal. The broad posterior plates of the palatines (about 9 inches across) overlap the pterygoids, leaving a free portion ranging from 3 to 6 inches. In *Balæna australis* (adult) the palatines almost cover the pterygoids and their hamular plates. The narrow external belt on the under surface of the maxillary is in contrast with the greatly expanded ventral surface of that bone in *Balænoptera physalus*, and even with the same region in the large *Balæna australis* from the North Sea (in the British Museum).

The brain-cavity in the huge head of this species would apparently hold four human brains, and it adjoins great air-spaces.

The study of the skull of this group demonstrates the essential difference between it and the Airthrey occiput.

In *Balænoptera physalus* the facies of the occipital region diverges much from that in *Balæna mysticetus* both in the

shape of the occipital and in the form of the temporal arch. The anterior edge of the occipital is usually convex and more or less semicircular, whilst the region immediately behind is in the larger examples (*e. g.*, in that from Milford in the British Museum) deeply hollowed, with a well-marked median ridge anteriorly, continued to the hollow in front of the condyles. In some a group of bony granules occurs laterally on the occipital surface. The breadth of the skull above the temporal arch is 3 feet 8 inches, whilst across the temporal arch it is 5 feet 9 inches. The articular processes of the temporals project further downward in *Balæna mysticetus* than in *B. musculus*. In smaller examples (*e. g.*, no. 1790 *c*) the concavity is less, but the curve of the anterior edge remains. The hollow is so marked in the former that a rigid bar resting on the prominent lateral edges would have a space beneath it in the middle of about 8–9 inches in depth. The palatines are proportionally shorter than in *B. mysticetus*, and overlap the pterygoids only by an inch, and the hamular process is curved, smaller, and less flattened. In the specimen in the Royal College of Surgeons the vomer shows no special posterior median process, and has probably been injured. The maxillaries in the roof of the mouth are much broader posteriorly than in *B. mysticetus*, and are separated from the palatines by a fissure on each side fully 2 inches wide posteriorly, but less anteriorly. In the large northern right whale in the same collection the maxillary plates are narrow and confined to the outer border—at a distance from the palatines and the median rostrum. In other examples, however, they extend further inward. The bony ring round the *foramen magnum* is about 2 inches in thickness at its upper arch. The lower end of the *foramen magnum* joins at an acute angle a narrow intercondylar triangle 1 inch wide, whereas in *Megaptera* the angle is obtuse and the upper part of the intercondylar space is a wide triangle (3 inches wide and 2 inches long). The curve in the rostrum is very slight.

In lateral view the contrast between *Balænoptera physalus* and *Balæna australis* is marked, for the squamosal in the former passes forward as a massive, rounded, and nearly horizontal arch to the frontal, but takes no share in the ocular socket. The articular piece for the mandible being more or less transverse in position, whereas in *B. australis* the flattened articular plate slants from behind forward and outward, thus being distinctly oblique, and takes a considerable share in the formation of the orbit posteriorly. Moreover, it descends much further below the projecting

exoccipital. The spout-like appearance of the parts, indeed, in the southern right whale is diagnostic, and the facies of the temporal fossa or passage diverges, for it goes downward and outward, whereas in *B. physalus* it opens downward and forward.

The occipital region in *Megaptera longimana* is marked, in comparison with *Balæna mysticetus* and *Balænoptera physalus*, by its massiveness and great breadth and by the wider zygomatic arch, which, as the minute and accurate account of the example from the Tay by Prof. Struthers* shows, encloses a wide though somewhat shorter temporal passage. The temporals slope backward with rounded posterior ends, their outer edges being nearly horizontal, and, sloping forward and outward, end in a blunt edge less elongated than in *B. physalus*. The exoccipitals form smoothly rounded masses on each side, toning off to the temporals, with a rounded lower edge, a ridge, and a groove. A deep notch separates them from the pterygoids and the basi-occipital. In the horizontal position the base of the occipital condyles projects 2–3 inches. The hamular processes project nearly straight backward, with the large cavity to the exterior and running to the notch of the exoccipital. The *septum narium* (vomer) is nearly symmetrical, and a blunt process projects inferiorly to the extent of $1\frac{3}{4}$ inch. The exoccipitals are smoothly rounded inferiorly, with a rough surface externally and a suture separating them from the temporals. In the horizontal position the occipital (squamous portion) slopes upward and forward, and the projecting temporals continue the curve. This large example presents a rounded (semicircular) edge to the occipital anteriorly, and there is a total absence of a median ridge, as in the specimen from the Tay described by Prof. Struthers. As mounted in the Dundee Museum †, the squamous portion of the occipital is deeply hollowed, without a trace of a median ridge, the bone on each side rising to the prominent lateral margin. The median hollow extends all the way from the *foramen magnum* to the anterior edge, which measures 9 inches across and is nearly straight. The parietal overlaps the horizontal part of the frontal internally, and passes forward almost as far as the tip of the nasals, but the spur of the maxilla with the frontal process intervenes. The suture between the parietal and temporal is well marked in this skull, which Prof. Struthers thought incompletely ossified,

* Journ. Anat. & Physiol. vol. xxiii. p. 316 &c.

† I am indebted to Dr. Miller and Mr. Duncan for facilities in the examination of the specimen.

and the same may be said of the outer edge of the squamous portion of the occipital. There is no great ridge at the junction of the occipital and squamosal, only a slight elevation. The articular process of the squamosal is deep—about 2 feet 5 inches in lateral view. At the upper curves of the temporal arches the skull is 3 feet $1\frac{1}{2}$ inch across. It is fully 60 inches across the zygomatic arches. When viewed laterally the curve or arch over the inner edge of the temporal fossa is much more pronounced than that of the Airthrey whale. The temporal comes to an acute angle at the upper and posterior part of the curve. The large occipital condyles in lateral view project boldly backward, and the outline of the occipital curves outward and backward from their base. In other examples (*e. g.*, 79*z b*, Brit. Mus.) a high median ridge extends from the anterior border almost to the *foramen magnum*. Further, the occipital in front is hollow. The upper border of the *foramen magnum* is only about $\frac{1}{4}$ inch in thickness, whereas the lower border is of great thickness. The occipital condyles are narrower than in *B. physalus*, but the intercondylar space between them is wider, as Struthers shows. In an adult from Greenland the malar (jugal) is present and forms a thick process in front, tapering posteriorly where it joins the zygoma to complete the ocular socket. In the Greenlandic specimen from Prof. Eschricht the long diameter of the skull is 8 feet $8\frac{3}{4}$ inches, across the zygomatic arches 5 feet $3\frac{1}{2}$ inches, and across the temporo-squamosal articular pieces 4 feet $5\frac{1}{2}$ inches.

In a young *Megaptera longimana*, procured from the Museum, Wellington, New Zealand, and now in the British Museum, the skull presents a total length of 7 feet 1 inch, whilst across the zygomatic arches it is 5 feet 6 inches and between the temporal bosses posteriorly 3 feet 4 inches. The great breadth of the occiput in proportion to its length is marked, and a slight median ridge is present. The *foramen magnum* has a comparatively thick upper edge (fully $\frac{3}{4}$ of an inch), whilst the inferior wall is massive. The outer edges of the exoccipitals are free and so inward to the auditory groove and canal. The temporal, anteriorly and inferiorly, is less developed than in the adult, but similar in proportion, the curve for the condyle forming a smooth large arch internally. A well-marked median ridge occurs on the supraoccipital from the front to within 5 inches of the *foramen magnum*. The temporal fossa is proportionally less, but the temporal suture follows the course in the adult, and is distinct over the maxillary. The temporal (zygomatic)

arch is less, whilst the gap between the temporal arch and the frontal is proportionally larger. The inward curve and concavity at the posterior part of the region are marked. In lateral view the maxillary is slightly curved, whereas in the adult it is nearly straight, with the roughened surface for the baleen-plates. The sutures between the maxillæ, premaxillæ, and vomer are all distinct. One tympanic is in position, smoothly rounded internally, but with a groove externally near the middle. The cavity in the pterygoid is open posteriorly, and the hamular process is short and blunt, projecting out about $\frac{3}{4}$ inch. The suture between the palatine and the pterygoid runs from behind upward and outward to the roof. The vomer has only a blunt knob far in front of the position in the adult, and is much less developed. The mandible shows the curves of the adult, but the condyle is proportionally less developed. In lateral view the angle is more prominent, since in the adult the large boss slopes downward and forward, though apparently there is considerable variation, since in specimen 792 *b* from Greenland, an older form, the angle is still prominent in lateral view with a groove between it and the projecting condyle above. The coronoid process forms a wedge-shaped projection bent outward and about $2\frac{3}{4}$ inches high on the left side, whilst on the right its tip is truncated. The nutritive foramen is very large. The curves of the supraoccipital in this young form approach those of the Airthrey fossil, but the occipital region, as a whole, is broader in proportion to its antero-posterior diameter, and there is also the slight median ridge.

In contrasting the occipital region of the skull in *Megaptera* with that of *B. physalus*, the general outline differs, though both are triangular, and the temporal arch in *Megaptera* makes a larger angle with the skull than in *Balænoptera physalus*, since the cranium is proportionally broader and more massive. A median ridge only occurs in *Megaptera* and it falls short of the condylar region, whereas in some specimens of *Balænoptera* additional ridges are present, though they vary in the several examples, either forming a cross by a median ridge, or a Λ widening out from the front. The sulcus on each side of the occipital condyles is narrower in *Megaptera*, thus permitting a more massive expansion of the lateral occipital region. The articulation of the frontal with the temporal arch is more complete than in *B. physalus* and the parts more massive.

The Airthrey skull agrees with *Megaptera* in its great breadth proportionally, and in the outline of the lateral margins of the squamous region of the occipital, as seen

from the dorsum, the whole forming a triangular area (*Van Beneden* and *Gervais*), though the anterior curves diverge and the lateral edges are higher in *Megaptera*; further, the outline from the occipital goes slightly downward in *Megaptera*, but rises with a forward sweep in the Airthrey whale. But it differs from it in the more pronounced or higher arch over the temporal fossa in *Megaptera* when viewed from the side, for the deep median sulcus of the bone rises to prominent lateral margins; in the comparative straightness of the lateral margins of the occipital and the breadth of its anterior suture; as well as in the more elongated anterior region as a whole, the antero-posterior diameter being less in proportion to the breadth; in the less elevated *processus jugulare* of the occipital, though this is not a strong point; and in the absence of rough elevations so characteristic of the Airthrey occipital. The great breadth of the anterior edge of the supraoccipital (1 foot 6 inches) would alone distinguish it from *Megaptera*, which shows, for instance, in the Tay whale a breadth of only 9 inches, yet the approach to *Megaptera* in certain features is noteworthy.

In *Balænoptera borealis* the anterior border of the supra-occipital forms a flat arch much as in *B. sibbaldii*, but the bone is hollowed all the way forward from the condyles, though at the bottom of the hollow is a slight ridge. The horizontal plate of the frontal is large, whilst the temporal passage is somewhat triangular and not very large. The maxillæ and premaxillæ are more curved in lateral view than in *B. sibbaldii*, and so with the mandible. The posterior region of the skull, the exoccipital, and the temporo-squamosal arch are less massive than in either *Megaptera* or *B. physalus*. A feature well marked in lateral view is the bold outward curve of the massive arch in *Balænoptera physalus*, thus affording a contrast with that in *B. borealis*, and the ocular socket quite differs. The outward curve of the mandibles is less than in *Balæna mysticetus*.

In 1860*, after a storm, the posterior part of the cranium of a huge whale was tossed on shore in the Baltic, and it was diagnosed by Dr. Hagen as belonging to *Megaptera*, and allied to the Cape form. Eschricht had similar views, though he did not think it belonged to *M. longimana*. Aug. Müller again, after a careful re-examination, differed from the former view, and considered it a *Balænoptera*, giving the specific name *syncondylus*, from the union of the two occipital condyles. He supposed that the species might

* Van Beneden and Gervais, 'Osteographie des Cétacés,' 1880, p. 266.

still be living, that the specimen had been modified chemically, and its gelatine consolidated. The fragment consisted of the *foramen magnum*, two articular condyles, a part of the temporal, and pterygoid. The opinion of Van Beneden and Gervais, both in regard to this and another fragment of a cranium from the island of Sylt, was that they pertained to *Megaptera*.

In the subfossil skull in the vestibule of the Edinburgh Anatomical Museum (from Christie's Brickfield, Stirling), the occipital region is so imperfect that it is not available for comparison, and all that can be said is that the rostrum in lateral view presents a curve like that of *B. borealis*, but it may be a variety of *B. physalus*, as Sir William Turner* thought.

In none of the foregoing is there a near approach to the condition of the occiput in the Airthrey whale, and it is only when a large example of Sibbald's rorqual (Pl. IV. fig. 4) is examined, as, for instance, that from Rosslare, Wexford, in 1891 (92.3.1.1, British Museum), and which (a female) measured 82 feet in length, that a similar facies is met with. In this the anterior border of the occipital (supraoccipital) forms a transverse flat arch, the surface behind being flattened or even slightly raised in the middle, and with just a trace of a slight median (longitudinal) elevation, and a more distinct one in front of the *foramen magnum*. There is, moreover, about the middle of the occipital region a slightly elevated transverse ridge on each side, making by their junction with the median longitudinal elevation a +, and the surface is somewhat hollowed at this part, that is, between the anterior edges of the temporal arches. The occipital has a long (antero-posterior) diameter of 6 feet 10 inches, a transverse breadth on the flat behind the anterior edge of 2 feet, and a diameter of 3 feet at the temporal curve. Across the fronto-squamosal it measures 10 feet 1 inch, and across the posterior angle of the zygoma (articular region) 7 feet 11 inches. In front of the anterior edge of the supraoccipital is the narrow bar of the parietal, which from its thick angle on each side sends forward a long process as in the Airthrey whale. In front of this is the frontal with its serrated edge, to which the great nasals are attached. The junction of the massive nasals forms a median cone with a vertical ridge, then the anterior edge has a hollow curve, and again projects forward at the lateral attachment. The parietal, again, forms a great plate on the inner and

* Marine Mammals, Edinb. Anat. Mus. p. 68.

posterior wall of the huge temporal fossa, a suture separating it externally from the large temporo-squamosal, which meets the frontal plate externally—leaving a spacious passage of a somewhat triangular shape, the apex being external. The parietal has a long pointed apex on each side, passing forward 8 or 9 inches in front of the nasals. Internal to it are the great longitudinal ridges of the frontal, which are exposed on the right side by the removal of the premaxillaries. The palatines on the ventral aspect of the skull are separated by a narrow wedge-like fissure, and end posteriorly in two thick plates which are 2 feet across—that is, all over. The pterygoid is greatly flattened, a mere fissure about 3 inches long separating the scale-like hamular process from the sphenoid. The great posterior nares opened by a single aperture, the concavity of the vomerine edge being about a foot in front, then the two nares went forward. The nasals (16 or 17 inches long) are pointed posteriorly on the inner (ventral) surface, and bevelled anteriorly. The sphenoid forms a large boss on each side, to which the palatines are attached.

No other form shows the characteristic square outline of the supraoccipital in the Airthrey whale, except *B. sibbaldii*, and this, together with the great size and flattened surface of the region, points to a close connection. The points of difference are:—the more nearly triangular outline of the Airthrey skull, for the slope of the lateral margin is nearly straight, whilst those of Sibbald's rorqual show a curve, but an allowance must be made for variation.

In this huge example the neck of the humerus had a circumference of 3 feet. The radius was 3 feet $5\frac{1}{2}$ inches long, and the circumference below the head was 2 feet. The ulna was 3 feet 7 inches long, and the circumference round the olecranon 2 feet $2\frac{1}{2}$ inches, whilst below the olecranon it was 1 foot 4 inches. The scapula was 4 feet $9\frac{1}{2}$ inches across the superior edge, and from the glenoid cavity to the upper edge 2 feet 11 inches. The long diameter of the glenoid cavity was 1 foot 1 inch, and the shorter $9\frac{1}{2}$ inches. The length of the acromion was 1 foot $2\frac{1}{4}$ inches, and the coracoid 6 inches from the edge of the condyle to the tip.

All the observations here recorded were made before I found that Sir William Turner had specially referred to the Airthrey whale in the Introduction to his valuable 'Catalogue of the Marine Mammals in the Edinburgh Anatomical Museum'*. Moreover, that he had finally come to the

* Macmillan & Co., 1912.

conclusion that the skull pertained to Sibbald's rorqual, a conclusion which these independent observations can only corroborate. The photograph he shows on p. 6, however, gives an imperfect view of the form of the occipital, the fragment having been tilted too far forward, thus diminishing the antero-posterior diameter of the region. He is right in regarding Mr. Bald's estimate of the length (72 feet) as requiring revision, and in all probability it was considerably longer.

4. *On a Fragmentary Skull of* Balæna australis, *Desmoulins, in the British Museum.*

The posterior region of an unknown skull in the British Museum comes from the Antarctic seas, and was procured by Sir George Newnes in the voyage of the 'Southern Cross' in 1900 *. Sir Sidney Harmer tells me that on p. 321 of 'To the South Polar Regions' by L. Barnacchi, it is stated that two right whales were captured by the 'Southern Cross' at Campbell Islands during the winter of 1899. In all probability, this fragmentary skull pertained to one of these, though when Barnacchi comes to the account of the Campbell Islands he says nothing about capturing whales. The accompanying photograph (Pl. IV. fig. 5) was kindly sent by Sir Sidney with his note †.

In all probability the fragmentary skull was obtained at a landing-place or on the ice. The example consists of the occipital and neighbouring parts of the cranium, and is completely ossified (Pl. IV. fig. 5), so that it is more or less adult. Measured with a tape across the widest part of the temporal arch it is 7 feet 2½ inches, at the oblique masses of the temporals it is 4 feet 6 inches. The facies of the occipital region is that of a Balænid, the supraoccipital narrowing in front to a smooth saddle-like edge, whilst the surface is convex with a lateral groove which runs out on each side at the occipital condyle. Viewed from the dorsum the parietal is only shown at the outer edge, and it spreads over the frontal with a convexity on its outer border, and passes forward to the temporo-frontal passage, narrowing in the middle and again expanding at the aperture. It thus appears in lateral view bi-lobed. The

* Entered in the Museum Catalogue as No. 1.4.1.14.

† Sir Sidney Harmer, having met Lieut.-Commander Barnacchi since the foregoing note, tells me that the whale was killed in the winter of 1899 by a boat's crew from the 'Southern Cross' in the vicinity of Campbell Island, south of New Zealand.

longitudinal ridges of the frontal anteriorly are well marked, the frontal forming, besides, a collar 2 inches broad in front of the supraoccipital. The immense strength of the vault of the cranium at the inter-digitating plates of the frontal is a marked feature. A little depression occurs about 6 inches in front of the condyles, whilst at the sides of the latter the surface slopes downward. The *foramen magnum* is large (1½ inches in diameter), and its upper edge is about ¾ of an inch in thickness, whilst its inferior border is massive. The size of the aperture keeps the condyles wide apart anteriorly, so that the condylar groove, which is 3½ inches wide anteriorly, narrows posteriorly to an inch. The condyles are broad from side to side, and would nearly form a circle if joined. The narrow groove inferiorly widens out again on the basioccipital and disappears.

The exoccipitals extend downward and outward, so as to form a high basilar arch so characteristic of the right whales. A rough bony ridge forms a boss—more or less flattened—internally, and marked off from the descending process of the exoccipitals by a deep notch. The temporal arch is more horizontal than in the finners, and has a boldly curved inner margin with the broad and rounded end, whilst near the occipital the border curves forward to an angle, then slopes obliquely downward with a convex and then a concave outline, the tip again passing forward to meet the narrow frontal. The outer border is concave—much more so than in *Megaptera* and *Balænoptera*, though in the latter it is more highly arched. In lateral view this great articular process is narrower at the occiput, broader at the tip. The frontal, again, is proportionally a narrow, though massive, bar—also expanding at the tip to form the orbit.

Viewed from behind (Pl. IV. fig. 5), the flattened and slightly oblique plates of the pterygoids project behind and below the exoccipitals, the large air-cavity being external. They are thickened internally and the posterior end is truncated, whilst the anterior end is laminated. These pterygoid plates differ from those of *B. mysticetus*, which are much broader and flatter*. The palatines are absent, but the vomer presents two flattened articular surfaces for them.

The vomerine septum ends bluntly about 10 inches in front

* The covering of the pterygoids by the palatines differs in the various examples of B. *australis*, some, like the Zetlandic specimen in the British Museum, having the pterygoids almost entirely covered—whereas in other cases they are exposed for some inches. The inferior expansion of the maxillaries is greater in this species than in *B. mysticetus*, and the breadth of the nasals is greater.

of the edge of the pterygoid, and the suture between these bones is boldly marked. The frontal plates diverge from those of the finners, being thick and bar-like, broad toward the skull, narrowing in the middle, and again expanding to form a solid arch (slightly bifid) over the orbit. The articular surface of the temporal is rounded and rough, and the formation of the Balænid skull carries the articular process of the mandible further apart, so as to give greater freedom of action.

This fragmentary skull evidently is that of *Balæna australis*.

5. *On* Amphinome rostrata, *Pallas, in the Atlantic and Indian Oceans.*

Mr. F. A. Potts*, in his account of the Annelids of the Percy Sladen Expedition, found, in describing this species, certain discrepancies in comparing it with that procured by the 'Challenger,' thus the gills were even more densely branching than in that form, and "From a common base spring two main divisions, one inner, the other outer, which both give off five or six stout branches, dividing again into numerous terminal twigs. Both dorsal and ventral setæ appear to be quite free from serration, while both kinds of dorsal bristles in M'Intosh's specimen have this character. It is not possible to recognise the first stout type of dorsal setæ described in the 'Challenger' Report, all appearing to end in long tapering tips. While an authoritative description of the setæ in these specimens can hardly be given, it must be pointed out that—*e. g.*, in Quatrefages's description of *A. rostrata*—he refers to the dorsal setæ as tapering and smooth, and describes only a single type amongst them. It is noticeable that his material came from the Gulf of Bengal, Amboina, and the China Sea, and the suggestion may be made that the Atlantic form as described by M'Intosh differs from the eastern form." Mr. Potts does not allude to De Quatrefages's *Amphinome pallasii*.

A still more divergent view is that of Prof. Fauvel† in his splendid work on the Prince of Monaco's collection of Polychæts. He reinstates De Quatrefages's species *Amphinome pallasii*, and places the *A. rostrata*, as described in the 'Challenger' Report, under it. He re-describes the species, mentioning two kinds of dorsal bristles, long, fine,

* Trans. Linn. Soc. vol. xii., Zool. (1908).

† Campagnes Scient. Prince de Monaco, fasc. xlvi. p. 85 (1914).

capillary with the extremity curved, and provided with numerous spines, and a shorter stouter series, with lateral teeth like the barbs of a harpoon. The dorsal and ventral spines have enlarged tips like elongated buttons. The ventral bristles are strong and hooked at the tip. He does not think that *A. pallasii* and the 'Challenger' form pertain to the *A. rostrata* of Pallas. He places weight on the brown hue of the dorsal bristles as distinctive of the latter, and he repeats De Quatrefages's statement about the plaits of the caruncle of *A. rostrata*, Pallas, though qualified by the result of the action of the preservative fluid. He further quotes Horst as describing the Indian form as having the brown bristles without denticulations, and also Potts's views, concluding by summarising the distinctions between the Atlantic and Indian forms as follows :—

Amphinome rostrata, Pallas.	*Amphinome pallasii*, De Quatref.
Caruncle straight, long, sometimes plicated.	*Caruncle* short, smooth, cordiform.
Dorsal bristles of a deep brown, numerous, flexible, not stiff; two kinds: (1) capillary with smooth tips, (2) stouter forms also with smooth tips.	*Dorsal bristles* yellow or pale; standing stiffly up, and of two kinds: (1) long, with a curved point and finely spinous, and (2) stout straight bristles denticulated on each edge.
Habitat. Indian Ocean.	

My attention having been again drawn to the subject by the receipt of a very fine, large example from the Durban Museum, kindly sent by Prof. Gilchrist of the University of Cape Town, a further examination of both Atlantic and Indian examples has been made, and in this respect I have to thank Sir Sidney Harmer and Mr. Monro of the British Museum, as well as Mr. F. A. Potts of Cambridge, for their kind courtesy.

Little has to be added to the description of the Atlantic form from the Bermudas as described and figured in the 'Challenger' Report. As a preliminary step to the consideration of the divergent views, and as a caution, it has to be borne in mind that the modern methods of preserving these marine polychæts, viz., by placing them in formalin, leads to serious deterioration of their tissues, causing the delicate cirri to be shed in some, the bristles of *Amphinome* to be altered, and, if strong, the slippery bodies of the annelids glide from the forceps in examination. For these marine polychæts no fluid is so generally appropriate as methylated spirit, duly changed according to the methods

prescribed for use in the voyage of the 'Challenger.' Thus, after mounting, the dorsal bristles of the Atlantic form of *Amphinome* with their boldly serrated tips, in a day or two became quite smooth in Farrant's solution, and could be of no service in the discrimination; whilst the bristles of an Indian specimen in the British Museum were as limp as cotton fibres and devoid of all trace of serrations. The bristles of the Amphinomidæ are remarkable for their transparency and brittle nature, as well, apparently, as their chemical (calcareous) composition, and in some specimens the dredge, trawl, or net will sweep off almost the entire series from the dorsum—leaving only the branchiæ and cirri thereon above the level of the stumps of the bristles. Whether their habit of frequenting logs and rafts has any influence on these brittle bristles is unknown; but the perfect condition of the dorsal bristles of Mr. Potts's example from a raft in Pago Pago Harbour, Samoa, as well as the state of the 'Challenger' forms, would show that they seem to be in a safe environment.

That two recent and able observers, viz., Prof. Fauvel and Mr. Potts, have expressed doubts as to the identity of the Atlantic and Indian forms of *Amphinome rostrata*, and that the former has separated the two as distinct species, shows that there must be grounds for their views. In re-examining the two forms, the caruncle in the African example (which agrees in all respects with that from the Bermudas) is quite smooth, and the various tentacles rather short; that of the Indian form agrees in outline and smoothness, but has rather longer tentacles. There are no grounds in any example hitherto seen for the view that the organ is folded or plicated. Then with regard to the branchiæ, no denser tufts of branchiæ could well exist than those of the Atlantic form, which arising from a common base to the posterior and inner side of the dorsal bristles, split into two divisions, and these again into several main branches which rapidly subdivide into a dense series ending in the terminal filaments, which in the larger African example, of fully 7 inches, are thicker than in the Indian form of $5\frac{1}{2}$ inches, and they do not show the pinnate arrangement of the hypoderm so conspicuous in the latter—a feature, however, that may be partly due to the mode of preparation. This condition is also present to a less extent in the Indian example from the British Museum. These branchiæ are by much the most conspicuous organs on the dorsum, and they envelop the dorsal cirri and bristles, which are short in the

probably poor specimen. No Indian example hitherto observed has so dense a series of gills as the 7-inch South African form. In the Indian form, as Mr. Potts observes, the common base gives off two main branches, each of which divides into five or six stout branches, these again splitting into minute terminal twigs. The terminal filaments are certainly longer and more slender under a lens than those of the large African form. Moreover, the adjoining dorsal cirri are longer and more slender than those of the African, in which the branchiæ and cirri are pale, whilst those of the Indian are a rich brown. Age and long preservation, however, have to be remembered. The bodies of both have apparently been of the same slate-bluish colour.

When the dorsal tuft of bristles in the Atlantic form is examined, a brownish hue is evident, though it is not so deep as in certain forms of the Indian. Moreover, those of an Indian from Samoa stand stiffly up, and are pure white or glassy, the brown tint observed in the specimen in the British Museum and in those alluded to by Prof. Fauvel being almost entirely absent. Thus, the hue and the limpness cannot altogether be depended on. The limp condition—resembling wet cotton fibres—of the example of the dorsal bristles kindly forwarded by Mr. Monro from the British Museum is an illustration of the ruin caused by the preservative liquid. Further, as typical of *Amphinome*, every straight and stout dorsal bristle in the Indian form is boldly barbed, the two observers before mentioned having in all probability examined forms in which the bristles had been acted on by fluids of one kind or another, a result, as stated, so apt to occur. Amongst those typical bristles are certain brownish, slender forms with curved tips, in which it is exceedingly difficult to pronounce as to whether they are spinose or not in preserved specimens; yet both these and slender, pale, straight forms occasionally, even in these, show traces of the spines or minute prickles, and particles adhere to them. There can be no doubt about the presence of the rough points on these long curved bristles in the 'Challenger' specimens as described and figured in the Report, and more than once in the present inquiry a similar condition has been observed in the injured specimens. Bristles of exactly the same structure, with the finely tapered tips and tinted brownish, occur in the Cape form, though in the preparation no minute spines could be demonstrated. This, however, is not remarkable, since the serrations on the stouter straight forms could not be clearly made out, though certain traces

occasionally were discernible—the result of the action of the preservative fluid. The ventral bristles in both Atlantic and Indian forms consist of powerful hooks with similar curvature. In old examples, these and the dorsal bristles are much worn. The tips of the spines supporting the foot have the enlarged terminations in both Atlantic and Indian forms.

A consideration of all the points in the foregoing account of the two forms—Atlantic and Indian (Samoa form)—would seem to show that there is no valid reason for the view that they are other than varieties of the same species. That the typical *Amphinome rostrata* of Pallas has a plaited caruncle, or, of necessity, brown bristles (though such is common), limp bristles, stout bristles devoid of serrations, or spines without an enlargement at the tip, has been found to be due to a misapprehension or the result of the action of the preservative fluid. Consequently, the *Amphinome pallasii* of De Quatrefages and Fauvel is a species which rests on a misapprehension. Further, like many other Polychæts, the range of *A. rostrata* is very wide, both in the Atlantic and Indian Oceans, and, as stated in the 'Challenger' Report, the *Amphinome vagans* of Savigny and the *Pleione tetraeda* of Milne-Edwards belong to the same species.

EXPLANATION OF THE PLATES.

Plate III.

Fig. 1. Occiput of the Airthrey Whale in the Royal Scottish Museum, from the dorsum. It has been tilted too much forward, so that the anterior region of the supraoccipital is shortened.

Fig. 2. Occiput of Airthrey Whale, side-view.

Fig. 3. Occiput of the Airthrey Whale, viewed from the interior. The zygomatic regions have been injured by the workmen, who thought it was wood.

Plate IV.

Fig. 4. Dorsal aspect of the large female Sibbald's rorqual in the British Museum, measuring 10 feet 1 inch across the squamosals. The whale was 82 feet long.

Fig. 5. Posterior view of *Balæna australis*, Desmoulins, captured by the 'Southern Cross.' The condylar region of the occipital has been injured.

N.B.—For figs. 1, 2, and 3 I am indebted to Dr. James Ritchie of the Royal Scottish Museum; for fig. 4 to Mr. Pycraft and Mr. Fieldsent, and for fig. 5 to Sir Sidney Harmer, all of the British Museum.

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OCCIPITAL REGION OF THE AIRTHREY WHALE.

V.—*Note on a new Species of* Acuaria (*Nematoda*) *from the Adjutant-Stork.*

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In a recent paper * we gave descriptions of both sexes of a nematode from the Indian adjutant-stork, which we believed to be identical with Gedoelst's † *Echinuria leptoptili*. Gedoelst had only female specimens before him when his description was written, and we, at the time of writing, had unfortunately overlooked a paper by Gendre ‡ in which the morphology of the male was described. Later, on comparing our description of the male with that given by Gendre, we felt some doubt as to the identity of the species, but were unable at once to investigate the matter fully. Recently, however, we have received a private communication from M. Gedoelst, in which he expresses the view that our species is distinct from his, drawing our attention afresh to Gendre's paper, and begging us to seize an early opportunity of renaming the form described by us.

Accordingly, we have again compared the three descriptions referred to, and have also re-examined specimens of our species, now in the British Museum collection, and checked our description. As the result of this further study, we agree with M. Gedoelst that our "*Acuaria* (*Echinuria*) *leptoptili*," from the Indian bird, *Leptoptilus dubius*, cannot be regarded as identical with his species from the African marabout (*Leptoptilus crumenifer*).

The material described by Gendre (which included only one male) came from the same host-species, apparently, as Gedoelst's specimens, and the females, allowing for considerable variations in the measurements (due largely, according to Gendre, to different degrees of contraction), agree so well on the whole that their identity cannot be disputed. At the same time the measurements and general morphology of our own female specimens differ so little (again allowing for a certain amount of variation) from those described by the other authors, that it seems uncertain whether, in the absence of males, the Indian and African forms could be separated. We are therefore compelled to concentrate our attention upon the characters of the male described and figured by Gendre and those of our own male examples. Among the specimens

* Mem. Ind. Mus., Calcutta, vii. 4 (1922), p. 317.

† Revue Zool. Africaine, Brussels, v. 1 (1916), p. 52.

‡ Proc.-verb. Soc. Linn. Bordeaux, lxxi. 1 & 2 (1919), pp. 45–49.

retained in the British Museum * there are only two males, and these have been carefully re-examined. An unfortunate error that has crept into our description may be corrected here, the spicules of the male having been assigned to the wrong sides of the worm. The longer spicule is, as in Gendre's species and as is usual in the group, that of the left side, and not that of the right as stated in our paper.

The following are the chief differences which we find between our material and Gendre's description :—

1. *Total length*, in the males of our species, 11–11·5 mm.; length of Gendre's male 6·55 mm.

2. *Caudal papillæ of male.*—In both species there are nine pairs, but in Gendre's specimen the five postanal pairs are almost equally spaced from each other; whereas in our specimens the four posterior pairs are all grouped together in the posterior half of the tail, and the fifth pair widely separated from them and situated about midway between the fourth and the cloacal opening. Also in our species all the preanal papillæ have much longer peduncles than the postanal papillæ, the peduncles gradually increasing in length from the posterior to the anterior papillæ. In Gendre's figure, on the other hand, only the most anterior preanal papilla on one side is shown with a distinctly longer peduncle than the rest.

3. *Spicules.*—(*a*) The length of the left spicule in Gendre's form is 0·9 mm., in ours only 0·65–0·675 mm. The right spicule is 0·18 mm. long in Gendre's, 0·19–0·21 mm. in our species.

(*b*) The left spicule, according to Gendre, is barbed near the tip. In our specimens the barb has not been detected. The right spicule in Gendre's form is regular and almost cylindrical in shape, whereas in the Indian species it is irregularly twisted and flanged.

4. *Cephalic "cordons."*—These, in Gendre's male, extend backwards to a point only 0·61 mm. from the anterior end. In one of the two males now examined by us they extend as far as 1·06 mm. from the anterior end ; in the second, one "cordon" extends to 0·95 mm. and the other to 1 mm.

5. *Anterior division of œsophagus, or pharynx.*—The length of this organ, according to Gendre, is only 0·15 mm. in the male. In our males, as in the females, it is over 0·3 mm.

These differences, taken together, seem to afford sufficient grounds for believing that our Indian species is distinct from *Acuaria* (*Echinuria*) *leptoptili* (Gedoelst), and we accordingly propose for it the name *Acuaria* (*Echinuria*) *hargilæ*, sp. n. [*Hargila* is one of the Hindustani names of the Adjutant].

* The rest of the material is in the Indian Museum, Calcutta.

VI.—*New or little-known* Tipulidæ (*Diptera*).—XV. *Australasian Species.* By Charles P. Alexander, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

The new species of crane-flies described at this time are from New Zealand, and were collected by my friends Messrs. Campbell, Harris, Oliver, and Tapley, to whom I am indebted for many favours. The types are retained in the author's collection.

In this paper and others to be published under this title, the author has adopted the terminology of the male hypopygium proposed by Dr. G. C. Crampton in a recent paper ("The Genitalia of Male Diptera and Mecoptera," Trans. Amer. Ent. Soc. xlviii. pp. 207–225, 1923). The parts involved are the following: The so-called *pleurites* of earlier papers are the *basistyles*; the *pleural appendages* the *dististyles*; detached dorsal portions of basistyles occurring in certain Hexatomini, as *Epiphragma* and other groups, are the *interbases*; the *penis-guard* the *ædeagus*.

Dicranomyia fulvinota, sp. n.

General coloration of the thorax fulvous; head dark brown, yellowish anteriorly; halteres dark brown; wings with a strong brownish tinge, the stigma feebly indicated; *Sc* short, *Rs* and the basal deflection of R_{4+5} subequal; cell 1*st* M_2 rectangular; ventral dististyles of male hypopygium with a bispinous rostrum.

Male.—Length about 4·6 mm.; wing 6–6·5 mm.

Rostrum short, pale ochreous; palpi small, brownish black. Antennæ black throughout, the basal flagellar segments subglobular, soon passing into oval. Front and anterior part of vertex pale yellow, the remainder of the head dark brown, very sparsely dusted with pale brown.

Pronotum obscure fulvous yellow posteriorly. Mesonotal præscutum fulvous, brightest laterally, with faint indications of three fulvous-brown stripes; remainder of mesonotum fulvous, only the scutal lobes fulvous brown. Pleura fulvous or brownish fulvous. Halteres dark brown, the base of the stem pale. Legs with the coxæ and trochanters obscure yellow; remainder of the legs brownish black, the femoral bases rather narrowly pale. Wings with a strong brownish tinge, the stigma slightly darker brown, distinct but pale; veins dark brown. Venation: *Sc* short as in the

monilicornis group, Sc_1 ending a distance before the origin of *Rs* that is about equal to Sc_1 alone; *Rs* equal to or shorter than the basal deflection of R_{4+5}, feebly angulated near mid-length; cell 1*st* M_2 rectangular; basal deflection of Cu_1 before to just beyond the fork of *M*.

Abdominal tergites dark brown, the sternites pale; hypopygium obscure yellow. Male hypopygium very different in structure from that of *D. gracilis*, Edwards, or *D. weschei*, Edwards, approaching the typical form of the genus; basistyles with the mesal face produced into a very conspicuous lobe; ventral dististyle with a rostrum that is armed with two subequal spines near mid-length; dorsal dististyle a strongly curved acute spine. Gonapophyses with mesal apical angle produced into a slender, slightly curved rod, the apex blackened. Ædeagus divaricate at apex.

Hab. New Zealand (South Island).

Holotype, ♂, White Rock, Mt. Thomas, Canterbury, altitude 800 feet, November 26, 1922 (*J. W. Campbell*).

Paratopotype, sex?

The present species is very distinct from *D. monilicornis*, Hutton, a paratype of which is in my collection through the kindness of Mr. Speight.

Dicranomyia punctipennis maoriensis, subsp. n.

Male.—Length 5–5·6 mm.; wing 7·5–8 mm.

Rostrum and palpi dark brownish black. Antennæ black, the flagellar segments oval. Head grey.

Mesonotum dull light grey, the præscutal stripes and markings on the scutal lobes ill-delimited, brown. Pleura infuscated. Legs dark brown, the femoral bases narrowly and obscurely pale yellow. Wings with a faint greyish-yellow tinge; wing-markings very small, including the stigmal spot.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, October 10, 1922 (*T. R. Harris*).

Paratopotypes, 2 ♂♂, November 6–13, 1921; *paratype*, ♂, Taihape, October 18, 1922 (*T. R. Harris*).

This is very closely related to the Australian *D. punctipennis*, Skuse, and is best considered as being a geographical race.

Dicranomyia pictithorax, sp. n.

General coloration ochreous, the thoracic præscutum with three widely separated, dark brown stripes; pleura with a

narrow dark brown stripe ; rostrum as long as head; tarsi dark brown; wings narrowed basally ; Sc_1 very long, nearly as long as *Rs*.

Male.—Length 3·3–3·5 mm. ; wing 4·4–4·6 mm.

Female.—Length 3·6–3·8 mm. ; wing 4·8–5·2 mm.

Rostrum as long as the head, dark brown ; palpi four-segmented, inserted near mid-length of the rostrum. Antennæ dark brown throughout. Head dark brown.

Pronotum dark brown. Mesonotal præscutum gibbous, ochreous, with three conspicuous dark brown stripes, the median stripe broader, the lateral stripes, including the lateral margins of the sclerite, about equal in width to the pale interspaces : scutum ochreous, each lobe with the mesal and lateral margins dark brown, these being caudal elongations of the præscutal stripes ; scutellum ochreous with two small brown spots; postnotum ochreous, the basal lateral portions dark brown, representing the caudal end of the pleural stripe. Pleura ochreous yellow, with a narrow, dark brown, longitudinal stripe extending from the fore coxæ to the postnotum. Halteres elongate, dark brown, the extreme base pale. Legs with the fore coxæ and trochanters dark brown ; remaining coxæ and trochanters ochreous ; femora light brown ; tibiæ and tarsi dark brown. Wings with a faint greyish tinge; stigma very pale brown; veins dark brown. Wings strongly narrowed basally. Venation : Sc_1 ending opposite or before the origin of *Rs*, Sc_2 far from the tip of Sc_1, the latter about four-fifths the length of the relatively long *Rs* ; *Rs* about twice the basal deflection of R_{1+5}; *r* very faint ; cell 1*st* M_2 closed, the inner end arcuated so *r*–*m* is just before to just beyond mid-length of the cell; basal deflection of Cu_1 just beyond the fork of *M*.

Abdominal tergites dark brown, the sternites paler. In the female the subgenital segment is yellow, the base of the ovipositor dark brownish black.

Hab. New Zealand (North Island).

Holotype, ♂, Taumarunui, October 1, 1922 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, 1 ♂, 1 ♀.

Dicranomyia cuneipennis, sp. n.

Male.—Length 3·3–3·5 mm.; wing 4·5–4·6 mm.

Very similar to *D. pictithorax*, sp. n., from which it differs as follows :—

Mesonotum slightly less gibbous, the dorsum uniformly

dark brown, the pleura a little paler. Halteres very elongate, not noticeably brightened basally. Wings darker, the stigma nearly concolorous with the remainder of the wing. Wing narrowed basally, the anal angle little evident. Venation: *Rs* longer, Sc_1 ending a short distance beyond its origin; Sc_1 much shorter, less than one-half of the length of *Rs*.

Hab. New Zealand (North Island).

Holotype, ♂, Taumarunui, October 1, 1922 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, 1 ♂, 1 ♀; *paratype*, sex ?, Ohakune, altitude 2060 feet, November 16, 1922 (*T. R. Harris*).

Amphineurus, Skuse.

Nothormosia, subgen. nov.

Antennæ of the male elongate, approximately as long as the body, the flagellar segments elongate-cylindrical, provided with abundant erect setæ in addition to the short basal verticils. Wings with cell R_2 petiolate, the petiole subequal to *r–m*; cell 1*st* M_2 open by the atrophy of *m*; basal deflection of Cu_1 before the fork of *M*, the fusion being with *M* and M_3. Male hypopygium with the ninth tergite chitinized; basistyle produced caudad into a fleshy lobe; dististyles two in number, symmetrical.

Type of the subgenus, *Amphineurus insulsus* (Hutton) (Maorian Subregion).

Other included species are: *A. harrisi*, Alexander, *A. horni*, Edwards, *A. gracilisentis*, Alexander, *A. otagensis*, Alexander, and *A. recurvans*, Alexander.

Nesormosia, subgen. nov.

Antennæ short in both sexes, the flagellar segments with verticils that are slightly longer than the segments. Wings with cell R_2 petiolate, the petiole subequal to *r–m*; cell 1*st* M_2 open by the atrophy of *m*; basal deflection of Cu_1 close to the fork of *M*, the fusion being with M_3. Male hypopygium asymmetrical, the dististyles of the two sides differently constructed.

Type of the subgenus, *Amphineurus fatuus* (Hutton) (Maorian Subregion).

Amphineurus subfatuus, Alexander, is also a member of this group.

Amphineurus lyriformis, sp. n.

Male.—Length about 4 mm.; wing 4·8 mm.

Allied to *A. senex*, Alexander, differing as follows:—

Mesonotal præscutum more testaceous brown, the median lobe of the scutellum and a broad median stripe on the postnotum dark brown. Knobs of the halteres brighter yellow. Wings paler, the dark pattern almost obsolete. Male hypopygium with the apical lobes of the basistyle about intermediate in length between those of *A. senex* and *A. campbelli*. Dististyles two, the outermost a straight chitinized rod with a conspicuous lobe on the mesal face near mid-length; inner style arcuate, the apex feebly serrulate; the so-called basal dististyle, which from its position would seem to be an interbase, is a heavily chitinized, sinuous rod, the base dilated, thence narrowed into a neck, beyond mid-length slightly enlarged and gradually narrowed to an acute point. Gonapophyses slender, the two together appearing lyriform, approximated at base, each gradually narrowed to the long attenuate point, at about two-thirds the length bent strongly mesad, their outline thus following that of the above-described basal dististyle.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, December 1, 1922 (*T. R. Harris*).

Amphineurus submolophilinus, sp. n.

Male.—Length about 5·5 mm.; wing 7·5 mm.

Generally similar to *A. molophilinus*, Alexander.

Mesonotal præscutum reddish brown, the remainder of the mesonotum darker brown. Pleura brownish black, clothed with conspicuous white setæ. Halteres obscure yellow. Legs obscure yellow, clothed with abundant, black, appressed setæ. Wings with a strong yellowish tinge, the membrane with abundant brown trichiæ; veins brown. Venation: *Rs* elongate; cell R_2 very short-petiolate, the basal section of R_2 perpendicular, with a short spur; cell 1*st* M_2 small, the veins issuing from it correspondingly elongate.

Male hypopygium differing in details of structure from that of *A. molophilinus*. Distal ends of the basistyles not produced into slender attenuate lobes. Outer dististyle dilated apically, the lateral angle extended into a long curved point. Interbase almost straight, before the acute apex with a few denticles. Gonapophyse near mid-length,

greatly twisted upon itself, the distal section an acute, nearly straight spine, directed caudad and mesad. In *A. molophilinus* the distal ends of the basistyles are produced into slender lobes; outer dististyle obliquely truncate, the lateral angle a moderately long and rather straight point. Interbase a long, gently sinuose rod with conspicuous erect spines before the tip and a linear row near base. Gonapophyses lyriform, each appearing as a stout horn, directed laterad, thence caudad, and finally mesad and caudad.

Hab. New Zealand (South Island).

Holotype, ♂, Governor's Bay, Canterbury, altitude 80 feet, October 29, 1922 (*J. F. Tapley*).

"Sweeping near stream."

Molophilus multispinosus, sp. n.

General coloration pale brownish yellow; antennal scape light yellow; halteres dark brown, the base of the stem paler; wings strongly tinged with yellow; male hypopygium with basistyle unarmed at apex; inner dististyle terminating in a slender black rod that is provided with many erect spines; lateral style roughly triangular in outline, apex truncated, produced into a flattened ear-like lobe.

Male.—Length about 3·8 mm.; wing 4·6 mm.

Rostrum and palpi brownish black. Antennal scape conspicuously light yellow; basal segment of flagellum pale brown; remainder of the organ broken. Head grey, paler adjoining the inner margin of the eye.

Pronotum and mesonotum pale brownish yellow. Propleura and mesopleural episternum infuscated. Halteres dark brown, the basal half of the stem yellowish. Legs with the coxæ and trochanters light yellow, the outer face of the fore coxa infuscated; femora obscure yellow; tibiæ and tarsi brown. Wings with a strong yellowish tinge, the base and costal region brighter; veins yellow. Venation: basal section of R_{1+5} nearly twice *r–m*; petiole of cell M_3 about twice the basal deflection of Cu_1; vein *2nd A* long, extending to beyond mid-length of the petiole of cell M_3.

Abdominal tergites dark brown, the sternites a little paler; hypopygium obscure brownish yellow. Male hypopygium complex, very distinct in structure from any species of the genus so far made known. Basistyles short and stout, the lateral apical angle produced caudad into a stout lobe that is setiferous but otherwise unarmed; dististyles two, on mesal face of basistyle near mid-length, the inner

style stout at base, the apex narrowed into a slender, curved, black rod that is provided, except at its base, with many conspicuous erect spines; lateral style a stout blackened blade, the base short and stout, gradually triangularly dilated, with a truncate apex; at the base of this apex produced laterad into a slender black rod; the apex bearing a large, ear-shaped, black lobe that is subacute at apex.

Hab. New Zealand (South Island).

Holotype, ♂, White Rock, Mt. Thomas, Canterbury, altitude 860 feet, November 26, 1922 (*J. W. Campbell*).

Molophilus repandus, sp. n.

General coloration brownish yellow; antennæ short; wings tinged with yellow; male hypopygium stout, with the basistyles produced caudad into an erect lobe, the mesal face blackened, spinulose; outer dististyle with a long slender rod at base.

Male.—Length about 3·2 mm.; wing 4·2–4·3 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown, the scapal segments a little paler. Head dark grey.

Mesonotum uniform obscure brownish yellow, the scutum and scutellum a little more testaceous. Pleura concolorous, the dorsal pleurites weakly infuscated. Halteres testaceous, the knobs slightly darkened. Legs with the coxæ and trochanters obscure brownish yellow; femora light brown, the tibiæ and tarsi gradually darkened into brown. Wings with a strong yellowish tinge; veins brownish yellow; macrotrichiæ brown. Venation: vein *2nd A* elongate, ending about opposite mid-length of the petiole of cell M_3.

Abdominal tergites pale brown, the sternites and hypopygium obscure brownish yellow. Male hypopygium stout, the basistyles broad basally, the apex of each produced caudad into an elongate lobe that culminates in an acute black tooth; on the mesal face, extending basad from this tooth, are two gently divergent blackened ridges, the ventral ridge weakly spinulose, the other ridge nearly smooth; these ridges extend almost to mid-length of the style. Dististyles two, on the mesal face of the basistyle, the inner style a straight rod with the apex obtuse, blackened, and very feebly serrulate; outer style a shorter blackened blade, the apex microscopically serrulate; at the base produced into a long, slender, blackened rod that is directed mesad and caudad; on the margin of the blade, immediately above this rod, a conspicuous erect spine.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, November 14, 1922 (*T. R. Harris*).

Paratopotypes, 5 ♂ ♂, November 14–16, 1922.

Molophilus tenuistylus, sp. n.

Allied to *M. howesi*, Alexander; general coloration black; antennæ short; head dark grey; male hypopygium with the dististyles slender, acutely pointed, their margins smooth.

Male.—Length 2·3–2·5 mm.; wing 3·5–3·6 mm.

Female.—Length 2·7–3 mm.; wing 4·1–4·3 mm.

Rostrum and palpi dark brown. Antennæ short, brown, the scapal segments obscure testaceous. Head dark grey.

Mesonotum dark brownish black, the humeral angles of the præscutum paler; lateral margin of the præscutum narrowly sulphur-yellow. Pleura brownish black. Halteres pale yellow, the knobs bright sulphur-yellow. Legs with the coxæ obscure testaceous yellow, the fore coxæ darker; trochanters yellow; femora brown, the tibiæ and tarsi passing into dark brownish black. Wings with a strong blackish tinge; veins darker brown. Venation: petiole of cell M_3 nearly three times the basal deflection of Cu_1; vein *2nd A* ending about opposite one-third the length of the petiole of cell M_3.

Abdomen brownish black, including the hypopygium. Male hypopygium of the type of *M. terminans*, and most similar to that of *M. howesi* among the described species, but the dististyles even more slender; outer dististyle a strongly curved, flattened blade, gradually narrowed to an acute point, beyond mid-length bearing a conspicuous, acute, marginal spine; inner dististyle shorter, sickle-shaped, acutely pointed, the margins smooth, the surface near mid-length bearing 6–9 conical spinulæ.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, November 14, 1922 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, 18 ♂ ♀, November 14–22, 1922.

Molophilus morosus, sp. n.

General coloration brown, the postnotum and pleura dark brown; antennæ short; halteres with sulphur-yellow knobs; legs yellow; wings faintly tinged with grey, the costal and stigmal areas yellowish.

Male.—Length about 4 mm.; wing 5·3 mm.

Rostrum and palpi brownish black. Antennæ short, dark brown throughout, the segments with conspicuous erect white pubescence. Head light brown.

Pronotum light yellow. Mesonotal præscutum brown, the lateral margins indistinctly paler, the humeral triangles obscure yellow; scutum brown; scutellum reddish brown; postnotum dark brown. Pleura dark brown. Halteres pale, the knobs light sulphur-yellow. Legs with the coxæ yellow, the fore and middle coxæ dark brown; trochanters obscure yellow; remainder of legs yellow, the terminal tarsal segments infuscated. Wings with a faint greyish tinge, the base and costal region distinctly yellowish, including the stigmal area; veins and macrotrichiæ pale brown. Venation: vein *2nd A* long, ending about opposite four-fifths the length of the petiole of cell M_3.

Abdomen dark brown, the sternites very slightly paler. Male hypopygium with each basistyle produced into a slender chitinized spine at apex, these directed strongly cephalad. Outer dististyle bifid at apex, the lateral arm much larger than the mesal arm, its apex truncated, the caudo-lateral angle weakly serrulate; mesal arm a stout chitinized spine. Basal dististyle a long rod, the apical third blackened and gently curved, this blackened apex bearing numerous small appressed spinules and terminating in about three longer slender spines.

Hab. New Zealand (South Island).

Holotype, ♂, Glenorchy, Otago, altitude 1200 feet, December 30, 1922 (*F. S. Oliver*).

Molophilus flavomarginalis, sp. n.

General coloration dark brown; head and lateral margin of præscutum sulphur-yellow; halteres with the knobs sulphur-yellow; wings broad, faintly tinged with brown; male hypopygium with the inner dististyle a simple, feebly chitinized, straight rod.

Male.—Length about 2 mm.; wing 2·9 mm.

Allied to *Molophilus pictipleura*, Alexander.

Rostrum and palpi brownish black. Antennæ with the first scapal segment pale brown, the second segment dark brown; flagellum broken. Head sulphur-yellow above, passing into brown on the genæ and beneath.

Pronotum sulphur-yellow. Mesonotum dark brown, the margin of the præscutum conspicuously sulphur-yellow, this colour continued caudad to the wing-root; scutellum paler brown. Pleura and sternum dark brown, the dorsopleural membranes a little paler. Halteres brownish

testaceous, the knobs conspicuously sulphur-yellow. Legs with the coxæ concolorous with the pleura: trochanters obscure brownish yellow; remainder of the legs broken. Wings broad, faintly tinged with brown, the base and cells *C* and *Sc* more yellowish; veins pale brown. Venation: petiole of cell M_3 about twice the basal deflection of Cu_1; vein *2nd A* ending a little beyond the origin of the petiole of cell M_3.

Abdomen dark brown, the hypopygium obscure yellow. Male hypopygium with the basistyles produced apically into a mesally directed, slender, chitinized spine; immediately before this spine, the style is clothed with abundant setæ. Dististyles two, situated at base of mesal face of basistyle; outer style bifid at apex, the two arms subequal in length, mesal arm a black spine, lateral arm a flattened truncate blade; inner or cephalic style a simple straight rod, only feebly chitinized, tapering to the acute apex, the surface sparsely provided with small appressed spinulæ or tubercles. A conspicuous plate, shaped somewhat like an hour-glass, at base of ædeagus.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, November 14, 1922 (*T. R. Harris*).

Molophilus aucklandicus, sp. n.

General coloration pale yellowish brown, the margins of the præscutum brighter yellow; head dark grey; knobs of the halteres dark brown; wings greyish subhyaline; vein *2nd A* short; male hypopygium with the basal dististyle a long, straight, chitinized rod that tapers gradually to a long chitinized spine, the surface of the style with conspicuous appressed spinules.

Male.—Length about 2·5 mm.; wing 3·5 mm.

Female.—Length about 3–3·2 mm.; wing 3·6–3·8 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown. Head dark grey.

Mesonotum shiny pale yellowish brown, the lateral margins of the præscutum brighter yellow. Pleura yellowish testaceous, the dorsal region indistinctly darker. Halteres pale brown, the knobs conspicuously dark brown. Legs with the coxæ and trochanters yellowish testaceous; remainder of the legs pale brown, the terminal tarsal segments darker. Wings greyish subhyaline, the macrotrichiæ dark brown, veins pale brown. Venation: vein *2nd A* short, as in *M. parvulus*, Alexander, ending before the level of the fork of *Cu*.

Abdominal tergites dark brown, the hypopygium obscure

yellow. Male hypopygium with the apex of each basistyle produced into a slender, heavily chitinized spine that is longer and more conspicuous than in related species ; outer dististyle chitinized throughout its length, bifid at apex, the lateral arm expanded into a flattened blade with the apex truncate but distinctly serrate on the caudo-lateral angle ; mesal arm approximately as long, the apex subacute, blackened ; basal dististyle a long, straight, chitinized rod that tapers gradually to a long chitinized spine, the surface of the rod covered with conspicuous appressed spinules.

Hab. New Zealand (North Island).

Holotype, ♂, Auckland, June 26, 1922 (*T. R. Harris*).

Allotype, ♀, Ruapehu, altitude 4500 feet, February 27, 1922 (*T. R. Harris*).

Paratopotype, ♂ ; *paratypes*, 11 ♂ ♀, Ohakune to camp on Ruapehu, altitude 2060–4000 feet, February 26, 1922 (*T. R. Harris*); 4 ♂ ♀, Ruapehu, at camp, altitude 4500 feet, February 27, 1922 (*T. R. Harris*).

Limnophila (*Metalimnophila*) *nemocera*, sp. n.

Antennæ of the male approximately as long as the body ; tips of the femora not darkened ; wings pale yellow, the stigma conspicuous, brown ; veins pale ; cell 1*st* M_2 small ; cell 1*st A* narrow.

Male.—Length about 5·2 mm. ; wing 5·5 mm.

Rostrum and palpi dark brown. Antennæ exceedingly long and slender for a member of this group, the longest of any member of the subgenus so far described, being approximately as long as the entire body, dark brown throughout. Head dark greyish brown.

Mesonotum uniform light reddish brown. Pleura concolorous, with a conspicuous dorsal fuscous stripe, passing immediately beneath the base of the halteres. Halteres long and slender, pale throughout. Legs with the coxæ, trochanters, and femora pale brown, the latter not darkened apically ; tibiæ and tarsi dark brown. Wings uniform light yellow, with a conspicuous, oval, dark brown stigma ; veins very pale, only a little darker than the ground-colour. Venation : Sc_1 ending just before the fork of *Rs*, the longer Sc_2 at its extreme tip but faint ; *Rs* relatively short, arcuated at origin ; *r* faint, immediately before mid-length of the stigma and about twice its length from the tip of R_1 ; cell 1*st* M_2 very small, the elements closing it very faint and without macrotrichiæ ; cell M_1 about two-thirds the length of its petiole ; basal deflection of Cu_1 about one-third its length beyond the fork of *M* ; cell 2*nd A* relatively narrow.

Abdominal tergites dark brown, the sternites a little paler. Male hypopygium with the distal prolongation of the basistyle relatively long, the apex feebly notched; dististyles two, the outer slender, the apex very slightly bifid; inner style shorter, broad-based, narrowed to the slender apex, the whole appearing more or less bottle-shaped.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, September 17, 1922 (*T. R. Harris*).

Limnophila oliveri, sp. n.

General coloration clear light grey; antennæ short, black; mesonotal præscutum with five brown stripes; femora black except basally; wings with a yellowish tinge, cells *C* and *Sc* brownish yellow; small brown spots on the cross-veins and deflections; distal half of cell R_5 clouded with brown.

Male.—Length 8 mm.; wing 8·7 mm.

Female.—Length 10 mm.; wing 10 mm.

Rostrum and palpi black. Antennæ short in both sexes, black, the elongate first segment grey-pruinose. Head light grey, with an indistinct brown median line; head somewhat narrowed posteriorly.

Mesonotal præscutum dull grey with five brown stripes, the median stripe broad and further divided by a capillary dark brown vitta that continues cephalad on to the pronotum; sublateral stripes two on either side, relatively indistinct; pseudosutural foveæ very distinct, black; scutum and scutellum grey; a small impressed area on either side of median lobe of scutellum at base; postnotum grey, infuscated posteriorly. Pleura light grey-pruinose. Halteres obscure yellow, the knobs dark brown. Legs with the coxæ brown, light grey-pruinose; trochanters obscure yellow; femora black, the basal third obscure yellow; tibiæ light brown, the narrow base and broader apex black; basitarsi brown, the tips and remainder of the tarsi black. Wings with a yellowish tinge; cells *C* and *Sc* brownish yellow; stigma oval, dark brown; small brown spots at origin of *Rs*, Sc_2, along the cord and outer end of cell 1*st* M_2; tip of R_2; fork of M_{1+2}; faint brown clouds along *Cu* and in the distal half of cell *Rs*; veins brownish yellow, darker in the infuscated areas. Venation: Sc_1 ending just before the fork of *Rs*; *r* about twice its length from the tip of R_1 and a little less than this distance beyond the base of R_2; basal deflection of Cu_1 only a short distance beyond the fork of *M*; arculus complete.

Abdominal tergites dark brown, pruinose, the sternites more sparsely so.

Hab. New Zealand (South Island).

Holotype, ♂, Glenorchy, Otago, altitude 1200 feet, December 23, 1922 (*F. S. Oliver*).

Allotopotype, ♀.

Paratopotype, ♂.

This interesting species is most closely related to *L. indecora*, Alexander (Australia). It is named in honour of the collector, Mr. F. S. Oliver, to whom I am indebted for many Tipulidæ from Lake Wakatipu.

Limnophila quæsita, sp. n.

Antennæ short; general coloration brownish black; wings uniformly tinged with pale brown, the stigma darker; cell M_1 lacking; male hypopygium with the outer dististyle toothed at apex.

Male.—Length 4·8–5 mm.; wing 6·2–7·2 mm.

Female.—Length 5·6 mm.; wing 5·8 mm.

Rostrum and palpi brownish black. Antennæ short, black, the flagellar segments short-oval. Head dull leaden-grey.

Mesonotum dark, with a sparse brown pollen, subshiny, the humeral angles of the præscutum a little brighter; scutellum and postnotum more pruinose. Pleura grey, with indications of a dorsal darker longitudinal stripe. Halteres pale, the knobs brown. Legs with the basal portions of the coxæ concolorous with the pleura, the apices paler; middle and posterior coxæ long; trochanters obscure yellow; remainder of the legs dark brown; tibial spurs conspicuous; ungues small, simple. Wings uniformly tinged with pale brown, cells *C* and *Sc* a trifle more yellowish; stigma oval, brown; veins dark brown, conspicuous. Venation: Sc_1 ending opposite the fork of *Rs*, Sc_2 a very little shorter than Sc_1; *Rs* long, gently arcuated; *r* very faint, nearly three times its length from the tip of R_1; R_{2+3} about equal to the basal deflection of Cu_1; inner ends of cells R_3, R_5, and 1*st* M_2 in alignment; cell M_1 lacking; cell 1*st* M_2 relatively small, rectangular; basal deflection of Cu_1 more than half its length beyond the fork of *M*; vein 2*nd A* elongate, ending just before the level of the origin of *Rs*; anterior arculus present.

Abdominal tergites dark brown, including the hypopygium; basal sternites a little paler. Male hypopygium with the basistyles relatively long; dististyles two, the outer heavily chitinized throughout, slender, narrowed to the

subacute apex, immediately before the tip with a tiny curved spine so the apex appears weakly toothed; inner style very small, fleshy, tapering to the blunt apex. Ædeagus slender. Gonapophyses very inconspicuous.

Hab. New Zealand (North Island).

Holotype, ♂, Taumarunui, October 1, 1922 (*T. R. Harris*).

Allotype, ♀, Ohakune, altitude 2060 feet, November 8, 1922 (*T. R. Harris*).

Paratopotype, ♂; *paratypes*, 2 ♂♂, with the allotype.

The female is generally similar to the male, but the general coloration is much brighter brown, especially the wings which are suffused with yellowish, the stigma oval, brown; petiole of cell R_2 equal to the basal deflection of R_{4+5}. This is a very distinct crane-fly and has no close ally among the described species of the genus.

Gynoplistia hyalinata, sp. n.

Size very small (wing, ♂, under 5 mm.); general coloration shiny black; antennæ with eight branched segments; legs black, the femoral bases very broadly yellow; wings nearly hyaline, the stigma pale brown; cell M_1 present.

Male.—Length about 3·3 mm.; wing 4·6 mm.

Rostrum and palpi black. Antennæ black, probably 15-segmented, the terminal flagellar segments broken, the formula being 2+2+6+?; the longest flabellation is six or seven times as long as the segment that bears it. Head shiny black.

Mesonotum entirely shiny black. Pleura black, with a sparse longitudinal row of silvery appressed pubescence occupying the dorsal pleurites and the mesepimeron. Halteres dirty white, the knobs dark brown. Legs with the coxæ shiny black, the apices paler; trochanters obscure brownish yellow; femora obscure yellow, the apices dilated, black; tibiæ and tarsi entirely black. Wings nearly hyaline; stigma large, pale brown; a very faint brown cloud at the fork of *Rs*; veins dark brown. Venation: *Sc* rather short, Sc_2 at the extreme tip of Sc_1, ending just before mid-length of the short arcuated sector; *r* about twice its length from the tip of R_1 and less than its length beyond the fork of R_{2+3}; cell M_1 equal to, or shorter than, its petiole; basal deflection of Cu_1 near two-fifths the length of cell 1*st* M_2.

Abdomen shiny black throughout.

Hab. New Zealand (South Island).

Holotype, ♂, White Rock, Mt. Thomas, Canterbury, altitude 800 feet, November 26, 1922 (*J. W. Campbell*).

Gynoplistia hyalinata is the smallest species of the genus so far described.

Gynoplistia ocellifera, sp. n.

General coloration rich brown, the mesonotal præscutum with three greyish-brown stripes that are narrowly bordered with dark brown; antennæ 20-segmented, the basal twelve flagellar segments short-pectinate; wings greyish subhyaline with a heavy ocellate pattern of light and dark brown.

Male.—Length 19 mm.; wing 20 mm.

Rostrum brown; palpi dark brown. Antennæ relatively small, dark brown, only the second scapal segment paler apically; antennæ 20-segmented, the formula being 2 + 12 + 6: the longest branch is a little more than four times the length of the segment that bears it; the basal pectinations lie in about the same plane as those that follow; the thirteenth flagellar segment is feebly enlarged basally, but is scarcely produced; terminal segment about twice as long as the penultimate. Head rich chestnut-brown, brightest on the vertex behind the antennal bases.

Mesonotal præscutum dark brown, with three greyish-brown stripes that are narrowly bordered with dark brown, the median stripe feebly divided by a capillary dark vitta, the humeral region a much warmer brown; pseudosutural foveæ conspicuous, elongate, light buffy in colour; scutal lobes dark brown, each with a greyish-brown centre, narrowly bordered by paler; median area of scutum greyish white, the colour produced caudad on to the median lobe of the scutellum; postnotum rather bright brown. Pleura dark brown, variegated with grey-pruinose areas. Halteres dull yellow. Legs with the coxæ and trochanters bright brown, more or less pruinose; femora obscure yellow, the tips dark brown; tibiæ brownish yellow, the tips indistinctly infuscated; tarsi light brown, the apical segments darker. Wings greyish subhyaline, with a very heavy yellow and brown pattern that is in part ocellate; cells *C* and *Sc* brownish yellow, the wing-base clearer yellow; ocellate areas in cells *R* and *M* at the base; near mid-length, with the origin of *Rs* as a centre; more diffusely along the cord; other circular areas in cell 1*st A*, one basal, the other subapical; small ocellate rings at the tips of veins R_1, R_2, R_3, M_2, M_3, Cu_1, and the fork of M_{1+2}; the ground-colour is confined to the cells *R*, 1*st* R_1, *Cu*, 1*st A*, and the distal cells; veins brown, narrowly bordered by yellow. Venation: *r* at tip of R_1 and just before mid-length of R_2; *r–m* very short; petiole of cell M_1 about two to two and one-half times *m*; basal deflection of Cu_1 at near four-fifths the length of the lower face of cell 1*st* M_2, the fusion of *M* and *Cu* being relatively short.

Abdomen with the basal tergite brown; remaining tergites brownish yellow, the posterior segments narrowly ringed caudally with dark brown; sternites dark brown.

Hab. New Zealand (North Island).

Holotype, ♂, Raurimu, June 7, 1922 (*T. R. Harris*).

Macromastix submanca, sp. n.

General coloration light grey, the præscutum with four black or brownish-black stripes; antennæ short; thoracic vestiture long and pale; wings with cell M_1 lacking; abdominal tergites brownish grey with a conspicuous brownish-black median line, the basal segments brightened laterally.

Male.—Length about 7·5 mm.; wing 13 mm.

Female.—Length about 10 mm.; wing 15 mm.

Frontal prolongation of the head pale brown, greyer laterally; nasus distinct, simple; palpi and mouth-parts dark brown. Antennæ short, pale brown, the second segment paler apically; antennæ apparently only 12-segmented, the terminal segment microscopic. Head greyish brown, the median area slightly darker.

Pronotum greyish brown, darker brown medially. Mesonotum light grey, the præscutum with four black (♀) or dark brown (♂) stripes, the intermediate pair separated from one another only by a capillary pale line; scutum dark grey, the lobes with dark centres, the posterior lateral angles and the median area of the scutellum reddish ochreous; postnotum brown. Vestiture of body consisting of elongate, erect, pale setæ. Pleura grey, the sternopleura darker grey; dorso-pleural membrane dark brown. Halteres brown, the base of the stem paler brown. Legs with the coxæ light grey; trochanters pale brown; femora brown, the bases obscure yellow; remainder of the legs black. Wings with a strong greyish tinge, the base, cells *C*, Sc, and R_2 tinged with brown; stigma oval, darker brown; veins dark brownish black. Venation: *Rs* equal to or longer than R_{2+3}; cell M_1 totally lacking; cell *2nd A* very narrow in the ♂, somewhat broader in the ♀.

Abdominal tergites brownish ochreous, grey-pruinose; first and second tergites light orange laterally; all tergites with a conspicuous, brownish-black, median stripe that includes the hypopygium; sternites yellowish grey, the basal sternites clearer yellow.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, October 19, 1922 (*T. R. Harris*).

Allotopotype, ♀.

VII.—*On new Species of* Brachycerus *from South and East Africa* (*Col.*, Curculionidæ). By Guy A. K. Marshall, C.M.G., D.Sc., F.R.S.

Brachycerus nigrofulvus, sp. n. (Fig. 1.)

♂ ♀. Integument dull black, the pronotum with the median furrow and a broad sublateral stripe on each side clothed with fulvous scaling; the elytra with the spaces between the dorsal tubercles also covered with fulvous scales, the tubercles and sides bare; the lower surface with the following fulvous markings:—a large transverse patch on each side of the metasternum between the coxæ, extending to the front margin of the metasternum laterally, and there nearly reaching the elytra, its lateral edge curving inwards behind, the venter with a large triangular median patch on ventrite 1 (3), a small median spot on 2 (4), and a bilateral row of spots on 1–4 (3–6); the legs without scaling.

Head bare, smooth, with a few scattered punctures and a low rounded elevation above and in front of the eye, separated from the rostrum by a broad and very deep furrow, which is vertical at the side and slopes backwards on the forehead, but is there separated from its fellow by a space nearly as wide as the funicle; the lower surface smooth and impunctate. *Rostrum* stout, strongly dilated from base to apex, the usual oblique incisions near the base almost obsolete; the dorsum almost flat and with deep separated punctures in the basal half, more declivous and shallowly depressed anteriorly, with a short obtuse median carina running backwards from the epistome; the mandibles shear-like, bidentate, the portion projecting beyond the mentum being almost as long as the latter; the mentum transverse, nearly kidney-shaped, with two shallow impressions separated by a low ridge. *Antennæ* with joint 2 of the funicle not longer than 3; the apex of club produced into a sharp point. *Prothorax* slightly longer than its basal width, with the sides sharply angulated in the middle, but not spinose; the base truncate, distinctly wider than the apex, which is arcuate dorsally and has well-developed postocular lobes; the dorsum with coarse, deep, more or less confluent punctures and a median furrow, which is deep in front, shallower behind, and subinterrupted in the middle, being bounded in front by two smooth, sparsely punctate ridges, which become flatter and broader behind, being roundly dilated in the middle and set with very large deep punctures, the transverse basal depression feeble; the

pleuræ with deep separated punctures, smaller than those on the disk, but, like them, each bearing a short stout black seta on the outer or anterior edge. *Elytra* rather narrowly elliptical in the ♂, broader in the ♀, with a catenulated row of small flattened tubercles along the suture, and intervals 3 and 5 each with a row of larger similar tubercles, which are sometimes linked together, each bearing 3–6 shallow punctures containing a short recumbent black seta; intervals 2 and 4, in the ♀ only, with a few very small tubercles, each

Fig. 1.

Brachycerus nigrofulvus, Mshl., sp. n., ♂.

bearing a single setigerous puncture; the first four, very irregular, rows of punctures usually with flattened bare unisetigerous granules between the punctures; the inflexed margins with irregular rows of deep punctures, the intervals not tuberculate, but with very sparse minute setigerous punctures, and sometimes subcostate in the ♂; the scales small, lanceolate, dense, and overlapping. *Legs* coarsely punctate, but not scabrous, each puncture bearing a recumbent black seta on its anterior edge; all the tibiæ finely carinate

on the dorsal edge, the front pair with the outer apical angle not produced but broadly rounded; the hind tibiæ flattened on the inner face towards the apex, the corbel enclosed, the outer apical angle rounded and not produced, the inner one shortly produced into a broad lamina that is sinuate at its apex; the tarsi with a broad bare area down the middle on the lower surface and with dense tufts of stiff setæ along the sides, joint 4 somewhat compressed above especially towards the base, the claws without a lateral seta. *Venter* in one plane, coarsely punctate, the three intermediate ventrites about equal in length at the sides, the last one with a broad shallow apical impression in the ♂.

Length 16–22·5 mm., breadth 8–11·5 mm.

Cape Province: Willowmore (*Dr. H. Brauns*, type); Dunbrody, near Uitenhage (*Father J. A. O'Neil*).

Nearly allied to *B. globifer*, Thunb., but that species is proportionately a broader insect; the rostrum is not so strongly narrowed at the base, and the lateral furrows unite to separate it from the forehead; the prothorax is more transverse, the lateral angulation more acute, and the postocular lobes are obsolete; there is no fulvous scaling, the scales, when present, being minute, round, of a dirty grey colour, and not overlapping; and the intervals on the inflexed margins of the elytra are more or less tuberculate.

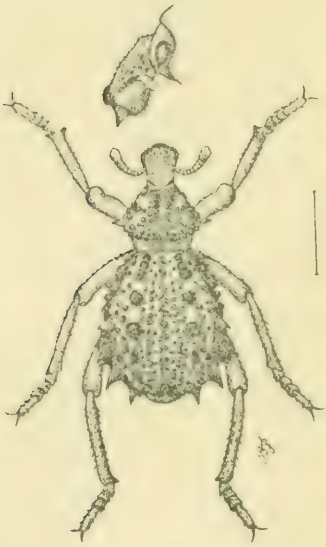
Brachycerus fucatus, sp. n. (Fig. 2.)

♂ ♀. The legs and rostrum entirely, the sides of the lower surface, the forehead, and the spaces between the tubercles on the prothorax and elytra clothed with fairly dense brown scaling; the two rows of large tubercles on the elytra with patches of paler buff scales between the tubercles.

Head with a deep horseshoe-shaped depression on the forehead, more or less filled in with brown squamose indumentum, thinner and darker scaling extending backwards (with the same width) right to the finely rugulose vertex; the squamose area with a few remote punctures, each containing a very short recumbent black seta; the lateral areas bare, opaque, and impunctate; no elevated ridge above the eye, the vertical furrow in front of it broad and very deep. *Rostrum* stout, gradually widened from base to apex, set throughout with coarse punctures that are more or less concealed by the scaling; the dorsal area slipper-shaped and almost flat throughout, subtruncate or broadly rounded at the base, which is raised high above the level of the forehead and sometimes has a shallow median impression, the lateral

margins rounded off near the base and without any definite oblique lateral incisions; the epistome triangular, bounded by a very steep carina, its front margin sinuate; the mandibles shear-like, bidentate, projecting far beyond the mentum, which bears a very deep U-shaped impression, the submentum not pedunculate. *Antennæ* with joint 2 of the funicle shorter than 1 and equal to 3, the club produced into a sharp point at the apex and the outer side strongly rounded. *Prothorax* a little longer than its basal width, strongly rounded at the sides and there armed with a sharp, outwardly directed spine;

Fig. 2.



Brachycerus fucatus, Mshl., sp. n., ♀.

the base feebly sinuate and much broader than the apex, which is broadly produced dorsally, the apex of the projection being subtruncate or slightly sinuate, the lateral lobes strongly developed, forming a rounded obtuse angle; the dorsum rather strongly convex longitudinally, fairly closely but somewhat unequally set with low bare tubercles, each having a stout recumbent black seta, the interstices being deeply foveate, but mostly filled up with indumentum and scaling; a very shallow median furrow containing a faint abbreviated carina, the furrow much deeper in front, where it is bounded

on each side by a ridge formed of agglomerated tubercles; the pleuræ with tubercles like those on the disk. *Elytra* rather broadly ovate, widest at the middle, each with two rows of larger tubercles (on intervals 3 and 5) bearing 3–5 setæ and devoid of scaling, the inner row with three or four smaller, closely placed tubercles at the base, followed by two larger ones with their apices flattened, the posterior ones sharply conical; the outer row with the tubercles on the posterior half very sharply conical and slightly curved, the basal ones more obtusely so; intervals 1, 2, 4 with irregular (often duplicated) rows of bare rounded granules, intervals 6–9 with regular and complete rows of small depressed shiny tubercles, the outer margin with a row of similar tubercles on the basal half and numerous small flattened granules on the apical half; the four outer rows of foveolæ fairly regular, those on the disk irregular. *Legs* quite smooth, with sparse black setæ; the tibiæ with a dense apical fringe of red-brown setæ, a short blunt inner mucro surrounded by setæ, and the outer apical angle roundly projecting, especially in the anterior pairs, the corbels of the hind pair indefinitely enclosed; the tarsi normally rounded above, joints 1–3 with a long outer and a short inner tuft of setæ on each side beneath, joint 4 with rather numerous irregular long stout setæ, the claws without a lateral seta. *Sternum* with no folds on the metasternum. *Venter* in one plane and coarsely punctate, the three intermediate ventrites subequal in length.

Length 11·5–17·5 mm., breadth 6·5–10 mm.

Tanganyika Territory: Morogoro, v. 1922 (*A. H. Ritchie*).

Described from eight specimens.

In general form and sculpture extremely like *B. brevicostatus*, Fhs., but the latter may be distinguished at once by its roughly granulate legs; the tarsi are compressed into a ridge above and bare down the middle beneath; the base of the rostrum is not raised above the forehead, and there is an elevate ridge above the eye, etc.

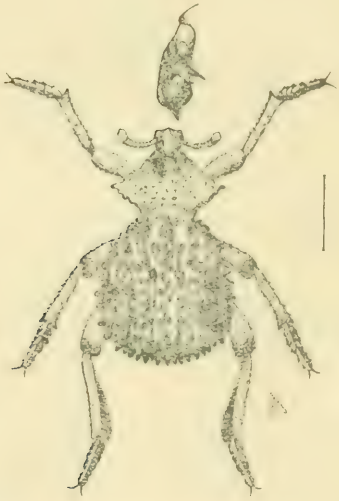
Brachycerus fimbriatipes, sp. n. (Fig. 3.)

♂ ♀. The rostrum, prothorax, and legs (except the tarsi and the apices of the femora, which are bare) covered with dense buff scaling, turning in parts to orange-red or crimson, especially on the disk of the pronotum, the genæ, the coxæ, the tibiæ, and the lower surface of the femora; the elytra with large irregular patches of buff and orange scaling on the disk, especially between stria 3 and the suture, and the sides

and apex bare ; the venter with red scaling along the sides and also in the middle of the two basal ventrites.

Head bare, except for a small patch of orange scales on each side of the forehead, with deep separated punctures anteriorly, and with a well-marked ridge above and in front of the eye, separated from the rostrum dorsally and laterally by a broad deep furrow. *Rostrum* stout, gradually dilated from base to apex, and set throughout with coarse reticulated punctures ; the dorsal area not raised above the forehead, slipper-shaped, broadly rounded at the base, not obliquely incised at the sides, nor markedly dilated above the antennæ ;

Fig. 3.



Brachycerus fimbriatipes, Mshl., sp. n., ♂.

the surface almost flat, with a broad shallow median impression at the base and a short broad low median ridge near the apex ; the epistome triangular, the front margin sinuate, the bounding carina broad and ill-defined behind, merging imperceptibly into the median ridge ; the mandibles shear-like, bidentate, projecting well beyond the mentum, which is shallowly and irregularly impressed, the submentum with no trace of a peduncle. *Antennæ* with joint 2 of the funicle shorter than 1 and equal to 3, the club with the apical edge rounded off and terminating in a short point. *Prothorax* as

long as the basal width, strongly dilated at the sides and there armed with a stout sharp conical tubercle; the base truncate and much broader than the apex, which has a subtruncate dorsal median projection, the lateral lobes well developed and forming a rounded right angle; the dorsum comparatively even, set throughout with large deep punctures, most of the interspaces bearing a small bare flattened setigerous granule, with a very faint median furrow deepening into a large shallow fovea at the apex. *Elytra* globose, set with ten rather irregular rows of small conical tubercles, not differing very greatly in size, but those on intervals 5 and 6 rather more prominent than the others, especially behind the middle; interval 1 with the smallest tubercles, extending from near the base to the top of the declivity; those on interval 2 usually starting further from the base but reaching the apex; intervals 3 and 5 with the rows complete, the tubercles confluent near the base, then more or less duplicated as far as the middle; interval 4 without tubercles in the basal third, the row sometimes reduced to two or three behind the middle; row 6 with several tubercles missing, the remainder complete, the three outer ones lower than the others; the spaces between the tubercles set with large shallow foveolæ, which are regular at the sides and rather irregular on the disk; the tubercles each with an apical puncture containing a very short black seta. *Legs* with dense narrow scales and sparse recumbent black setæ; the tibiæ without a dorsal carina or an apical fringe, the anterior pairs with the apex sharply produced at both angles, especially the outer angle of the front pair, the hind pair not so produced, with the dorsal edge gently sinuate and the lower surface with a dense fringe of long erect black hairs on the distal two-thirds; the tarsi compressed dorsally into a sharp ridge, the lower surface flattened and bare, except for a fringe of dense setæ along the extreme lateral margins, the claws without a lateral seta. *Sternum* without folds on the metasternum. *Venter* with the three intermediate ventrites subequal in length, the basal one rather higher than the others, the anal one in the ♂ with a broad shallow apical depression and a dense patch of setæ on each side of it.

Length 11·5–14·5 mm., breadth 7–9 mm.

S. Rhodesia: Mt. Chirinda, Melsetter district, 1906 (*C. F. M. Swynnerton*).

Described from three specimens.

Belongs to the group of which *B. congestus*, Gerst., is the commonest representative, but most nearly allied to *B. amatongas*, Pér., which differs, *inter alia*, in the following parti-

culars:—The prothorax is not tuberculate laterally, but the sides are produced into a broad angle, the anterior side of which is convex and the posterior sinuate, the posterior margin of the elevated dorsal area is trisinuate, the disk is much more finely punctate, and without granules; the tubercles on the elytra are much smaller, more regular, and more nearly equal in size; the dorsal edge of the two anterior pairs of tibiæ is armed with a row of four or five conical teeth, and the hind pair lacks the dense fringe of setæ; on the posterior pairs of legs, on the outer or anterior face, the basal half of the femora and the apical half of the tibiæ are devoid of scaling.

B. picturatus, Fhs., from Natal, is also very similar, but has the front margin of the pronotum only gently rounded, the lateral angles much less acute and the dorsum coarsely scrobiculate; the anterior pairs of tibiæ have an interrupted carina on the dorsal edge, and the hind pair lack the dense inner fringe; the fourth joint of the tarsi is rounded dorsally and not compressed into a ridge, etc.

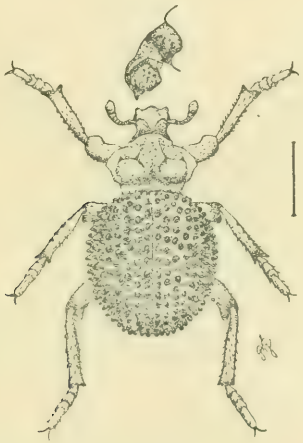
Brachycerus sculpticollis, sp. n. (Fig. 4.)

♂. Rostrum and dorsal area of head with orange-red or crimson scaling; the prothorax dorsally densely covered with creamy to pale buff scaling (except on the narrow carinæ) and more or less tinged with orange-red, the scaling ceasing abruptly at the lateral angles, the pleuræ being almost bare; the elytra speckled throughout with minute isolated white scales, giving them a frosted appearance, and with irregular spots on the disk (mostly on interval 2) formed of dense creamy or red scales and a regular row of creamy spots between the tubercles on the basal half of the fourth row from the lateral margin; the legs, including the tarsi, with dense buff or creamy scales, the apex of the femora red and the lower surface orange, the basal two-thirds of the outer face of the posterior pairs of femora bare; the lower surface almost bare, except for a band of pale scales along the hind margin of the prosternum and a large triangular lateral patch on each side of the mesosternum.

Head separated from the rostrum dorsally by a deep right-angled furrow, the squamose area with deep separated punctures, and a strong angulation above and in front of the eyes; the anteocular vertical furrow deep. *Rostrum* three-fourths the length of the pronotum, broad and deep, only slightly dilated in front, set throughout with deep separated punctures, the lateral [illegible] the level of the mesial [illegible] the lateral ones [illegible] curves longitudinally, the basal half

flat transversely, with the sides vertical, the basal margin subcostate, smooth and bare, the anterior half gently dilated above the antennæ and with a fairly deep longitudinal impression on each side; the epistome rather small, rounded behind, and without any definite limiting carina; the mandibles shear-like, bidentate, and projecting far beyond the mentum, which is shallowly impressed and has a distinct median carina, the submentum not pedunculate. *Antennæ* with joint 2 of the funicle shorter than 1 and equal to 3; the club terminating in a point. *Prothorax* as long as the basal width, strongly dilated laterally into a rounded angle with a notch behind it and markedly constricted near the base and

Fig. 4.



Brachycerus sculpticollis, Mshl., sp. n., ♂.

apex; the base truncate, broader than the apex, which is arcuate dorsally, the ocular lobes being very prominent and broadly rounded; the longitudinal outline highest near the base and sloping steeply in front; the dorsum comparatively smooth, covered with small deep separated punctures, and with two narrow admedian carinæ, which are outwardly angulated in the middle, the angle being produced outwards as a narrow transverse carina of varying length; the admedian carinæ turn outwards at the base for a short distance and terminate in a large obtuse knob, and the usual median apical fovea is practically obsolete; each puncture bears on one side a minute suberect seta. *Elytra* globose,

with twelve rows of rounded prominent granules, which are fairly regular except rows 3+4 and 6+7, these being really duplicated rows on what would normally be intervals 3 and 5: between the rows of granules are closely-set large deep punctures, which are mostly irregular on the disk; each granule bearing a minute horizontal black seta. *Legs*: the femora with rather sparse punctures having one of the edges subgranulate; the tibiæ with the setæ sparse and suberect, the inner apical angle produced into a long sharp process bearing a lateral tuft of setæ; the front tibiæ with an even longer process at the external apical angle, this being less developed in the median pair and quite absent in the hind pair; the anterior pairs of tibiæ with a row of four or five stout teeth along the dorsal edge; the tarsi with a broad bare space down the middle beneath, joints 1–3 with a dense tuft of black setæ on each side, joint 4 with a bilateral row of only three or four setæ, the claws without a basal seta. *Sternum*: a distinct transverse fold on each side of the metasternum. *Venter* with the basal ventrite raised above the others, the three intermediate ones subequal, the anal one with a broad shallow apical depression (♂).

Length 12·5 mm., breadth 8 mm.

S. Rhodesia: Plumtree, i. 1906 (*Father J. A. O'Neil*, type). Transvaal: Johannesburg, xi. 1905 (*A. G. Cook*).

Described from two specimens.

Very closely allied to *B. amatongas*, Pér., which has similarly disposed ridges on the pronotum, but they are much broader and covered with scaling, and the lateral angles are more acute; the granules on the elytra are distinctly higher and less close, those on interval 3 being more regular and but little duplicated, and the punctures are larger, the general sculpture being intermediate between that of *B. fimbriatipes*, sp. n., and *B. sculpticollis*, sp. n.

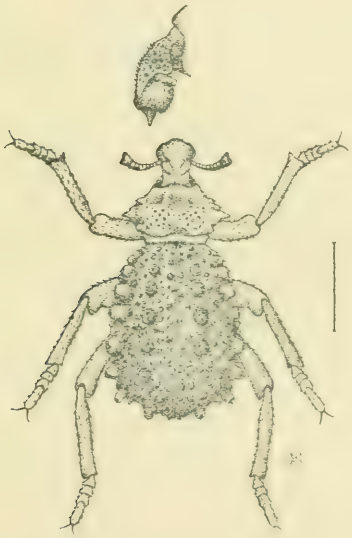
Brachycerus ritchiei, sp. n. (Fig. 5.)

♂ ♀. The head, rostrum, prothorax, sternum, and legs clothed with dense grey or brown scaling, which is much more sparse on the elytra, especially on the dorsum; the venter with ill-defined scaling along the lateral margins of the four basal ventrites.

Head smooth, even, and gently convex; the forehead, and the vertex over a space equal to the width of the forehead, covered with dense scaling, with a few short black setæ arising from concealed shallow punctures; the remainder of the head bare and quite smooth. *Rostrum* as long as the

pronotum, dilated from base to apex, slightly curved, and separated from head by a furrow which is very deep in front of the eyes and very shallow dorsally, being more or less filled in with a scaly indumentum ; the dorsal area slipper-shaped, broadly rounded at the base, with the usual shallow oblique lateral incisions at the basal fourth, which unite shallowly in the middle of the base, the anterior three-fourths almost flat, roundly dilated above the antennæ, and set with large shallow reticulate punctures, which are normally hidden by the scaling ; the mandibles shear-like, bidentate, without a scar

Fig. 5.



Brachycerus ritchiei, Mshl., sp. n., ♀.

and projecting far beyond the mentum ; the epistome small, almost semicircular, not emarginate in front, and projecting well beyond the truncate front margin ; the mentum broadly elliptical, with shallow inequalities, the submentum very feebly pedunculate. *Antennæ* with joint 2 of the funicle equal to 1 and longer than 3, joint 1 devoid of setæ ; the club obliquely truncate at the apex, the spongy portion being almost entirely withdrawn within the chitinous cup. *Prothorax* a little longer than its basal width, produced at the sides into a rather sharp conical projection about the

middle, the sides being convex in front of the angle and sinuate behind it, the basal transverse impression deep and abrupt ; the base truncate, distinctly wider than the apex, which is broadly rounded dorsally, the postocular lobes moderate ; the dorsal area with three deep foveæ in front divided by two high smooth ridges, the posterior portion forming a roughly oblong transverse elevation, set with large separated punctures, obtusely angulate posteriorly at the sides, and divided longitudinally by a broad furrow that is interrupted in the middle ; the punctures (often concealed) each bearing a recumbent black seta ; the pleuræ deeply and rugosely punctate, the upper intervals with large shiny black granules, each with a seta on its upper edge. *Elytra* regularly oval, each with two rows of moderately large rounded separated squamose tubercles extending to the top of the declivity, usually bare on the outer face and each with 3–9 subrecumbent setæ, the extreme basal tubercles usually smaller than the others ; the space between the outer row and the suture with deep irregular punctures, the interspaces and the sutural edge set with numerous small squamose setigerous tubercles ; outside the external larger row two irregular rows of small tubercles, followed by three more or less regular rows of deep punctures, the intervals bearing rows of depressed shiny granules, which are also present on the basal half of the outer margin. *Legs* smooth, with stout black subrecumbent setæ ; the tibiæ not carinate, the inner apical angle produced into a long sharp conical mucro, the outer one also distinctly produced ; the corbels of the hind pair enclosed ; the tarsi beneath with a very small tuft of setæ on each side of the three basal joints and two minute setæ in the middle, joint 4 with sparse isolated setæ throughout, the claws without a lateral seta. *Sternum* without any fold or tubercle on the metasternum. *Venter* all in one plane, the second visible ventrite laterally longer than the third and about as long as the fourth ; the fifth with a shallow apical impression in the ♂.

Length 12·5–17·5 mm., breadth 6·75–9·5 mm.

Tanganyika Territory : Morogoro, iv.–v. 1922 (*A. H. Ritchie*).

Described from twenty-one specimens.

Owing to its obliquely truncate antennal club and the general sculpture of the thorax and elytra this species belongs to the group represented by *atrox*, Gerst., *strumosus*, Pasc., and *salamensis*, Kolbe, which is characteristically East African. It comes nearest to the last-named, which differs, *inter alia*, in lacking the conical lateral tubercles on the

thorax, while the tubercles of the main rows on the elytra are much larger, all those in the outer row being sharply conical.

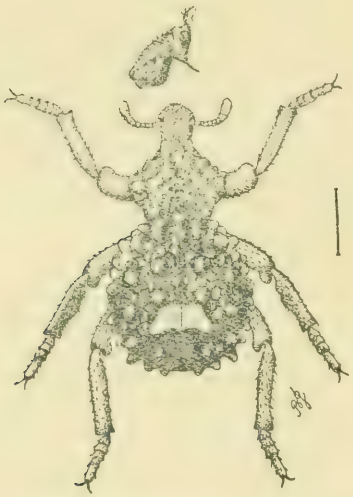
Brachycerus signifer, sp. n. (Fig. 6.)

♂ ♀. Integument black, covered beneath and for the most part above with dark brown scaling (reddish on red soils); the elevations on the median part of the pronotum and the upper surface of the tubercles in the two discal rows on each elytron terra-cotta to dark brick-red, the lateral prominences on the pronotum varying from buff to fulvous; the following white markings on the elytra: a tuft of scales on the scutellum, a short narrow stripe on the suture just behind it, and a large common sublunate patch behind the middle involving the fourth or fifth tubercle on each juxta-sutural row; a large creamy or buff patch about the shoulder and a similar one behind at the side of the declivity, these being linked together by a buff stripe between the two lateral rows of tubercles; the legs grey or brown, the posterior pairs of femora often darker and always with a whitish patch on the outer face not far from the apex. All these markings are usually more or less discoloured with soil or abraded.

Head with reticulate punctures throughout (more or less hidden by scaling), a broad frontal depression, and an obtuse elevation above the front of the eye, the incision between the latter and the rostrum more or less obscured by dense scaling. *Rostrum*, with the head, as long as the pronotum, covered throughout with deep reticulate punctures, of which only a trace can be seen through the dense scaling, and set with sparse short erect black setæ; the dorsal area gradually widening from the base to the middle, thence slightly narrowing to the apex, the posterior half with a very deep median basal impression, and the lateral edges rounded off, with only a trace of the usual oblique lateral incisions, the front half more declivous, almost flat or very shallowly impressed; the epistome semicircular; the mandibles rugose, without any scar, and projecting beyond the mentum, which is semicircular, impressed, and rugulose (usually filled in with dirt); the submentum with no trace of a peduncle. *Antennæ* with joint 2 of the funicle as long as 1 (on the outer or posterior face) and longer than 3; the club obliquely rounded off at the apex and without a sharp projection. *Prothorax* as long as its basal width, strongly rounded and irregularly tuberculate at the sides, widest a little before the middle; the basal margin deeply depressed, truncate and

but little wider than the apex, which is broadly but feebly rounded dorsally, the postocular lobes being moderate ; the dorsum strongly convex longitudinally, being deepest in the middle, the median area elevated and very rugosely punctate, but without shiny granules, produced anteriorly into two high smooth ridges reaching the front margin and shallowly impressed in the middle behind ; the lateral areas deeply but less rugosely punctate, with a large, outwardly projecting tubercle in the middle of each side, and a smaller just behind it which has its apex bare; the pleuræ uneven, coarsely punctate with three or four tubercles, at least one of which

Fig. 6.



Brachycerus signifer, Mshl., sp. n., ♀.

projects further outwards than the large dorso-lateral tubercle and all of which have a round shiny patch on the lower aspect, there being also usually several small shiny granules. *Scutellum* forming a small prominent tubercle crowned with a large transverse tuft of erect white or buff scales. *Elytra* subglobose, covered dorsally with an irregular net-work of deep foveæ, those on the inflexed margin forming three regular rows ; intervals 3 and 5 (nominal) each with a row of seven or eight large separated rounded squamose tubercles, that at the base of 3 being much larger than the rest, and some of

the others occasionally having a small shiny spot on the anterior slope; intervals 6 and 7 each with a row of smaller tubercles having a bare patch on the inferior aspect, those on 6 nearer to 7 than to 5 and not nearly reaching the base; the lateral intervals with depressed shiny granules, but these often missing, especially on interval 8; interval 1 without any trace of granules; the larger dorsal tubercles each with two to five short recumbent black setæ, the smaller lateral tubercles with a single pale one. *Legs* stout, densely squamose, and with intermingled black and white setæ; all the tibiæ with the external apical angle rounded and not produced, the obtuse internal mucro set with short stiff black setæ, and the dorsal edge without a carina; the tarsi squamose above and below, joints 1–3 with a tuft of a few stiff black setæ on each side beneath, joint 4 with only a row of three or four isolated single setæ on each side, the claws without a lateral seta. *Sternum*: the metasternum with a slight fold in front of the hind coxa. *Venter* with ventrite 2 (4) as long as the next two together, which are sunk rather below the level of the others, especially in the ♂, the anal ventrite with a feeble transverse impression in the ♂.

Length 6·5–10 mm., breadth 3·5–6 mm.

S. Rhodesia: Salisbury, xi.–iii. 1897–1901; Umtali, xii. 1900 (type); Mpudzi R., xi. 1901; Mt. Chirinda, xii. 1901 (*G. A. K. M.*).

Described from thirty-six specimens.

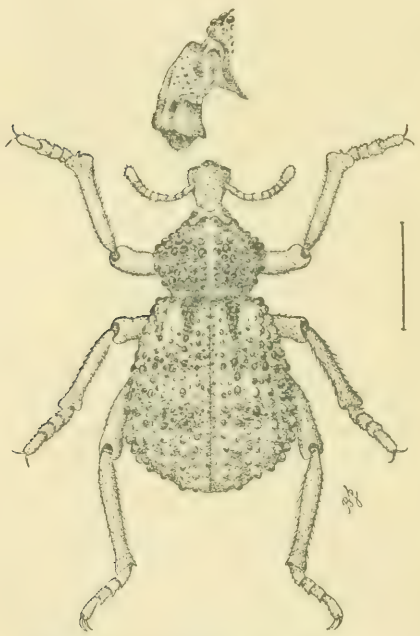
This species belongs to a group comprising *peregrinus*, Fhs., *hybridus*, Fhs., *pseudoscutellatus*, Fhs., *ephippiatus*, Fhs., *lividicollis*, Fhs., *clitellatus*, Fhs., and *sculpturatus*, Fhs., all of which have a small elevated scutellum crowned with a dense patch of erect scales (although Fåhræus mentions it only in the case of *pseudoscutellatus*) and all of which (except *ephippiatus* and perhaps *hybridus*) have a common transverse white patch on the elytra behind the middle. But from all these, except *ephippiatus*, the present species differs in having an elevation above the eye; in the other species the elevation, if present, is on the base of the rostrum. *B. ephippiatus* differs in having very high supraocular tubercles, which rise as high as the anterior ridges on the pronotum; there is no common white patch on the elytra, interval 7 bears depressed granules instead of elevated tubercles; the rostrum has a transverse median elevation beyond the middle and a longitudinal furrow in the basal half; all the setæ on the legs are black, etc.

Brachycerus asparagi, sp. n. (Fig. 7.)

♂ ♀. Integument black, the elytra brown variegated with irregular sandy patches or *vice versa*; the head, rostrum, entire legs, and lower surface covered with uniform smooth scaling varying from brown to putty-coloured.

Head smooth, densely squamose, with the forehead shallowly excavated to receive the rostrum, from which it is separated completely by a deep furrow that extends nearly down to the lower angle of the eye and widens from above downwards;

Fig. 7.



Brachycerus asparagi, Mshl., sp. n., ♀.

close to and parallel with the hind margin of the eye a deep furrow more or less hidden by scaling and a thin horizontal fringe of setæ. *Rostrum* stout, nearly as long as the pronotum, strongly dilated from base to apex, the base abruptly raised above the level of the forehead and shallowly bisinuate; the dorsum gently convex longitudinally, almost flat transversely, gradually widening from the base to the antennæ and thence parallel-sided with the lateral edges

rounded off in the posterior part, set throughout with deep separated punctures, each bearing a backwardly recumbent pale seta, and with a short obtuse median carina at the apex with a shallow depression on each side of it; the epistome much broader than long, with the apical edge truncate, and a deep emargination on each side of it; the mandibles obtuse, scarcely projecting beyond the mentum, and with a well-marked terminal scar; the mentum oblong, transverse, strongly punctate in front, each puncture bearing a rather long pale seta, impunctate and with a deep transverse impression in the basal half; the submentum with a short peduncle, and produced into an obtuse tooth behind it. *Antennæ* densely squamose throughout; the funicle with joint 2 as long as 1 (behind) and longer than 3; the club terminating in a short point. *Prothorax* as long as its basal width, strongly and subangulately rounded at the sides, broadest a little before the middle, and constricted near the apex; the base truncate and broader than the apex, the basal transverse depression deep and abrupt; the apical margin strongly produced in the middle dorsally, the apex of the projection being deeply emarginate and the ocular lobes moderate; the dorsum closely set with irregularly-shaped convex smooth impunctate tubercles, each with a pale seta on its inner edge, there being a narrow median line free from tubercles which is wider on the apical projection and at the extreme base; the tubercles are continued on to the apical projection, but not on the rest of the apical area, which is smooth and quite bare of scaling as far down as the lower angle of the eyes; the pleuræ with similar tubercles, which become smaller below. *Elytra* broadly obovate, widest far behind the middle, with regular rows of coarse punctures, the septa between which bear shiny granules in the basal half; the intervals with regular rows of closely set small tubercles which are bare at their apices, each carrying a horizontal pale seta (occasionally two or three); interval 3 with a short obtuse basal elevation, formed of agglomerated tubercles, which is broadest at the base and rapidly diminishes behind, a similar smaller formation on interval 5, and a low elevation at the apex of interval 9, otherwise the intervals evenly raised; the inflexed margins with similar sculpture, but the tubercles flatter. *Legs* quite smooth and impunctate, clothed throughout (including the tarsi) with dense fine scaling and sparse pale setæ; the front tibiæ with the outer apical angle shortly produced and broadly rounded, the apical margin fringed with short dense soft hairs and with a tuft of hairs about the middle behind the margin; the

hind tibiæ with the apex bevelled along the outer edge, the dorsal angle obtusely angulated; the tarsi clothed beneath with dense soft hairs, including joint 4; claws with an elongate basal lateral seta. *Sternum*: a deep fovea on each side of the prosternum in front of the coxæ; the metasternum with a distinct fold in front of the hind coxæ. *Venter* with shallow coarse punctures, each containing a recumbent pale seta, the three posterior ventrites on a slightly lower level than the anterior ones; ventrite 1 (3) with the intercoxal process as long as broad and with a curved transverse impression behind the coxæ; ventrite 2 (4) distinctly longer than either of the next two; the last ventrite with a very faint transverse impression in the ♂.

Length 14–17·5 mm., breadth 8–10·5 mm.

S. Rhodesia: Salisbury, xi.–iii., 1897–99 (*G. A. K. M.*, type); Umtali, xii. 1900 (*G. A. K. M.*).

Belongs to the group represented by *B. cordiger*, Sparrm., being most nearly related to *B. setipennis*, Fhs., a species which also feeds on wild asparagus; but in the latter the rostrum has a short deep sulcus at the base; the furrow behind the eyes is much broader and deeper; the apical projection of the pronotum is not emarginate, the postocular lobes are almost obsolete, and the tubercles are smaller and very unevenly distributed; the elytra are much less closely and more unevenly tuberculate, the callus at the base of interval 3 is much smaller and there is none on interval 5, the larger tubercles each bear three to six setæ, etc.

VIII.—*Notes on Synonymy in the Phytophaga* (*Coleoptera*).

By G. E. Bryant, Entomological Assistant, Imperial Bureau of Entomology.

In the process of rearranging the British Museum collection of Phytophaga all the material contained in the Museum has come under my observation, and I have now succeeded in bringing together the various collections acquired by the Museum, formed by Baly, Jacoby, Lewis, Blackburn, Sharp, Distant, and Godman and Salvin, which were not previously incorporated in the General Collection, which already contained the types of Lacordaire and Clark, a portion of Baly's, and Godman's Eumolpidæ. In addition to these collections, which are very rich in types, I have gone through a mass of accessions, which include very large collections made by Neave, Marshall, Dollman, and myself. The

families that are not as yet properly arranged are the Chrysomelidæ and Galerucidæ, which are very crowded and badly need expansion; but lack of cabinet-space prevents this.

During the course of this work I have had the opportunity of comparing all these types, with the natural result that a great number of specific names have to go; and I think it only right, for the sake of future catalogues, to publish this list of synonyms and corrections. I am able without hesitation to sink 110 species, and, with our greater knowledge of the genera gained by bringing together these types, to transfer many species to their more correct genera.

The British Museum collection of Phytophaga possesses types of Fabricius, Lacordaire, Clark, Hope, Baly, Jacoby, Blackburn, Sharp, Newman, Saunders, Kirby, Waterhouse, Marshall, and Gahan, totalling over 6800 types (excluding Cassididæ and Hispidæ), and a great number of co-types accumulated by Baly and Jacoby from continental workers, such as Suffrian, Stål, Chapuis, Lefévre, etc.

Previous to my work on the collection, Dr. C. J. Gahan had arranged the families Crioceridæ, Eumolpidæ, and Galerucidæ before the Jacoby collection had been acquired, and had made many notes, which have not been published, and which have been a help to me in this work.

An asterisk before the name of a species indicates that the type is in the British Museum, and C.T. a co-type.

Crioceridæ.

1. ***Bradylema indeterminata.***

**Lema indeterminata*, Clark, Cat. Phyt., App. 1866, p. 22. Guinea.

This species should go into the genus *Bradylema*, and is probably only a discoloured specimen of *B. robusta*, Lac.

2. ***Bradylema emarginata.***

**Lema emarginata*, Baly, Ent. Month. Mag. xiii. 1876, p. 6. S. Africa.

3. ***Crioceris dimidiaticornis.***

**Crioceris dimidiaticornis*, Lac. Mon. Phyt. i. 1845, p. 566. Madagascar.

**Crioceris madagascariensis*, Jac. Proc. Zool. Soc. Lond. 1897, p. 243. Madagascar.

4. ***Crioceris puncticollis.***

**Crioceris puncticollis*, Lac. Mon. Phyt. i. 1845, p. 567. S. Africa.

**Crioceris fuscopunctata*, Clark, Cat. Phyt., App. 1866, p. 67. Natal.

5. ***Lema ustulata.***

**Lema ustulata*, Lac. Mon. Phyt. i. 1845, p. 322. Senegal.
**Lema abyssinica*, Jac. Trans. Ent. Soc. Lond. 1895, p. 161. Abyssinia.

6. ***Lema angustomarginata.***

**Lema angustomarginata*, Jac. Proc. Zool. Soc. Lond. 1898, p. 214. Natal.
**Lema malvernensis*, Jac. Proc. Zool. Soc. Lond. 1904, p. 231. „

7. ***Lema bizonata.***

**Lema bizonata*, Clark, Cat. Phyt., App. 1866, p. 62. Amazons.
**Lema apioides*, Bates, Cat. Phyt., App. 1866, p. 62. „

8. ***Lema staudingeri.***

**Lema staudingeri*, Jac. Ann. Soc. Ent. Belg. xxxvii. 1893, p. 268. New Guinea.
**Lema meeki*, Jac. Stett. ent. Zeit. lxi. 1900, p. 383. Fergusson Is.

9. ***Lema variolosa.***

**Lema variolosa*, Baly, Trans. Ent. Soc. Lond. (n. s.) v. 1859, p. 146. Borneo.
**Lema verrucosa*, Jac. Stett. ent. Zeit. lx. 1899, p. 261. Java.

10. ***Lema multipunctata.***

**Crioceris multipunctata*, Clark, Journ. of Ent. ii. 1864, p. 249. N.S.Wales.
**Lema severini*, Jac. Ann. Soc. Ent. Belg. xxxvii. 1893, p. 267. N.S.Wales.

11. ***Lema balyi.***

**Lema balyi*, Clark, Cat. Phyt. 1866, p. 24. Sierra Leone.
**Lema africana*, Jac. Ann. Soc. Ent. Belg. xxxvii. 1893, p. 262. Sierra Leone.

12. ***Lema gravida.***

**Lema gravida*, Baly, Trans. Ent. Soc. Lond. (3) ii. 1864, p. 223. Port Natal.
**Lema nigropicta*, Jac. Trans. Ent. Soc. Lond. 1895, p. 160. Mashonaland.

13. ***Lema viridiænea.***

**Lema viridiænea*, Lac. Mon. Phyt. i. 1845, p. 353. S. Africa.
**Lema bifoveata*, Jac. Trans. Ent. Soc. Lond. 1901, p. 212. Natal.

14. ***Lema erubescens.***

Lema erubescens, Lac. Mon. Phyt. i. 1845, p. 412. Brazil.
**Lema immaculata*, Clark, Cat. Phyt., App. 1866, p. 51. „

15. *Lema sinuatonotata.*

**Lema sinuatonotata*, Clark, Cat. Phyt., App. 1866, p. 54. Rio Janeiro.
**Lema lineatipennis*, Baly, Cist. Ent. ii. 1879, p. 314. Brazil.

Megascelidæ.

16. *Megascelis suturalis.*

**Megascelis suturalis*, Lac. Mon. Phyt. i. 1845, p. 258. Mexico.
**Megascelis dilecta*, Clark, Cat. Phyt., App. 1866, p. 8. „

Megalopidæ.

17. *Mastostethus robustus.*

**Mastostethus robustus*, Clark, Cat. Phyt., App. 1866, p. 74. Brazil.
**Mastostethus jacobyi*, Clav. Gen. Ins. fasc. 33, 1905, p. 4. Bahia.

18. *Mastostethus sanguineus.*

Mastostethus sanguineus, Lac. Mon. Phyt. i. 1845, p. 636. Brazil.
**Mastostethus inornatus*, Bates, Cat. Phyt., App. 1866, p. 73. „

19. *Agathomerus violaceofasciatus.*

**Megalopus violaceofasciatus*, Jac. Biol. Cent.-Amer., Col. vi. 1, Suppl. 1888, p. 64. Panama.

20. *Megalopus thoracicus.*

**Megalopus thoracicus*, Jac. Entomologist, xxxvi. 1903, p. 182. Brazil.
**Megalopus brevipennis*, Jac. Entomologist, xxxvi. 1903, p. 183. „

21. *Colobaspis septemmaculata.*

**Colobaspis septemmaculata*, Hope, in Gray, Zool. Misc. 1831, p. 28. Nepal.
**Temnaspis nigroplagiata*, Jac. Ann. Mus. Civ. Gen. xxxii. 1892, p. 876. Burmah.

22. *Antonaria senegalensis.*

**Leucastea senegalensis*, Lac. Mon. Phyt. i. 1845, p. 724. Senegal.
**Pœcilomorpha luteipennis*, Westw. Trans. Ent. Soc. Lond. (3) ii. 1864, p. 273. Sierra Leone.
**Pœcilomorpha fulvicornis*, Jac. Trans. Ent. Soc. Lond. 1901, p. 213. Africa.

23. *Leucastea atripennis.*

**Leucastea atripennis*, Westw. Trans. Ent. Soc. Lond. (3) ii. 1864, p. 278. Old Calabar.
**Leucastea dahomeyensis*, Jac. Trans. Ent. Soc. Lond. 1901, p. 215. Dahomey.

24. *Temnaspis mouhoti.*

**Temnaspis mouhoti*, Baly, Ann. & Mag. Nat. Hist. (3) xiv. 1864, p. 435. Siam.
**Temnaspis oberthuri*, Jac. Ann. Soc. Ent. Belg. xxxix. 1895, p. 253. Burmah.

Clytridæ.

25. *Miopristis capensis.*

**Gynandrophthalma capensis*, Jac. Trans. Ent. Soc. Lond. 1901, p. 232. S. Africa.

This is evidently a ♀ *Miopristis*, and is allied to *M. lepida*, Lac.

26. *Miopristis varipes.*

**Gynandrophthalma varipes*, Jac. Proc. Zool. Soc. Lond. 1898, p. 218 (♀). S. Africa.
**Miopristis o'neili*, Jac. Proc. Zool. Soc. Lond. 1904, i. p. 236 (♂). S. Africa.

G. varipes, Jac., has been placed in the wrong genus by Jacoby, and is undoubtedly the ♀ of *Miopristis o'neili*, Jac.

27. *Teinocera nitidicollis.*

Teinocera nitidicollis, Lac. Mon. Phyt. ii. 1848, p. 18 (♂). S. Africa.
Lophobasis hieroglyphica, Lac. Mon. Phyt. ii. 1848, p. 21 (♀). S. Africa.

I have little doubt that these two forms are sexes of the same species.

28. *Atelechira capitata.*

**Damia capitata*, Jac. Proc. Zool. Soc. Lond. 1900, p. 207. S. Africa.

29. *Merilia parvula.*

**Titubœa parvula*, Jac. Proc. Zool. Soc. Lond. 1904, i. p. 239. Zambesi.

30. *Camptolenes marshalli.*

**Lachnœa marshalli*, Jac. Proc. Zool. Soc. Lond. 1897, p. 251. Natal.

31. *Lachnæa downesi.*

**Coptocephala downesi*, Baly, Trans. Ent. Soc. Lond. (3) iv. ii. 1865, p. 333. Bombay.

32. *Anomœa sphacelata.*

Anomœa sphacelata, Lac. Mon. Phyt. ii. 1848, p. 138. Mexico.
**Anomœa brevilineata*, Jac. Biol. Cent.-Amer., Col. vi. 1, Suppl. (1888). Mexico.

33. ***Barybæna strigatipes.***

**Damia strigatipes*, Jac. Proc. Zool. Soc. Lond. 1904, i. p. 239. S. Africa.

34. ***Gyriodera capensis.***

Dachrys capensis, Lac. Mon. Phyt. ii. 1848, p. 410. S. Africa.

This is not a *Dachrys*, which is confined to S. America, and I think it is better placed in *Gyriodera*.

35. ***Diapromorpha bohemani.***

**Gynandrophthalma bohemani*, Jac. Fauna Ind., Col. ii. 1908, p. 107. S. India.

Allied to *Diapromorpha sexmaculata*, Jac., from Burmah.

36. ***Ætheomorpha cochinchinensis.***

Gynandrophthalma cochinchinensis, Lef. Ann. Soc. Ent. Fr. (6) ix. 1889, p. 290. Cochinchina.
**Gynandrophthalma birmanica*, Jac. Ann. Mus. Civ. Gen. xxxii. 1892, p. 885. Burmah.

37. ***Ætheomorpha malayana.***

**Gynandrophthalma malayana*, Baly, Trans. Ent. Soc. Lond. (3) iv. 1, 1865, p. 51, t. ii. fig. 4. Batchian, etc.

38. ***Peploptera semifasciata.***

**Peploptera semifasciata*, Jac. Proc. Zool. Soc. Lond. 1900, p. 211. Mashonaland.
**Clytra lacordairei*, Jac. Trans. Ent. Soc. Lond. 1901, p. 216. Mashonaland.

39. ***Peploptera trilineata.***

Peploptera trilineata, Lac. Mon. Phyt. ii. 1848, p. 246. Natal.
**Peploptera irregularis*, Jac. Trans. Ent. Soc. Lond. 1901, p. 224. „

40. ***Peploptera eckloni.***

Peploptera eckloni, Lac. Mon. Phyt. ii. 1848, p. 244. Natal.
**Peploptera tibialis*, Baly, Trans. Ent. Soc. Lond. (3) ii. 1864, p. 224. Natal.

41. ***Ætheodactyla andrewesi.***

**Pseudoclytra andrewesi*, Jac. Ann. Soc. Ent. Belg. xxxix. 1895, p. 258 (*Titubœa*). India.

The genus *Pseudoclytra*, Jac., 1908, is a synonym of *Ætheodactyla*, Lac., 1848.

42. *Ætheodactyla plagiata.*

Pseudoclytra plagiata, Duviv. C. R. Soc. Ent. Belg. xxxv. 1891, p. 294 (*Clytra*). India.

43. *Ætheodactyla wallardiensis.*

**Gynandrophthalma wallardiensis*, Jac. Fauna Ind., Col. ii. 1908, p. 116. Travancore.

44. *Melitonoma contigua.*

**Titubæa contigua*, Lac. Mon. Phyt. ii. 1848, p. 149. S. Africa.

45. *Damia fulvcola.*

**Antipa fulvcola*, Jac. Ann. & Mag. Nat. Hist. (7) i., 1st May, 1898, p. 348. Transvaal.
**Damia mashuana*, Jac. Proc. Zool. Soc. Lond., 1st Aug. 1898, p. 217. Mashonaland.

46. *Cyaniris*, Redtb., 1845.

The name is preoccupied by *Cyaniris*, Dalm., 1816 (Lepidoptera).

Gynandrophthalma, Lacord. (Mon. Phyt. ii. 1848, p. 256), must be restored.

47. *Aspidolopha spilota.*

**Cryptocephalus spilotus*, Hope, in Gray, Zool. Misc. 1831, p. 30. Nepal.
**Aspidolopha rugosa*, Jac. Entomolog. xxiv., Suppl. 1891, p. 32. Sikkim.

48. *Gynandrophthalma nigrifrons.*

**Clytra nigrifrons*, Hope, Proc. Ent. Soc. Lond. 1842, p. 51. China.

49. *Gynandrophthalma chrysomeloides.*

Gynandrophthalma chrysomeloides, Lac. Mon. Phyt. ii. 1848, p. 268. India.
**Gynandrophthalma citrinella*, Jac. Faun. Ind., Col. ii. 1908, p. 115. N.E. India.

50. *Labidognatha cœrulans.*

Labidognatha cœrulans, F. Spec. Ins. i. 1781, p. 143. Guinea.
**Gynandrophthalma togoensis*, Jac. Deutsche ent. Zeit. 1895, p. 171. Togo.

Cryptocephalidæ.

51. *Cryptocephalus crucipennis.*

Cryptocephalus crucipennis, Suff. Linn. Ent. ix. 1854, p. 64. Bengal.
C.T. *Cryptocephalus birmanicus*, Jac. Ann. Mus. Civ. Gen. xxvii. 1889, p. 159. Burmah.

52. *Cryptocephalus faustulus.*

Cryptocephalus faustulus, Suff. Linn. Ent. ix. 1854, p. 83. India.
**Cryptocephalus pusensis*, Jac. Faun. Ind., Col. ii. 1908, p. 211. „

53. **Cryptocephalus bahiensis*, Jac.
**Cryptocephalus emarginata*, Jac. } Gen. *Stegnocephala.*

54. *Isnus discoidalis.*

**Cœnobius discoidalis*, Baly, Trans. Ent. Soc. Lond. 1877, p. 212. Natal.
**Isnus suturalis*, Jac. Proc. Zool. Soc. Lond. 1904, i. p. 248. „

55. *Melinobius suspectus.*

**Cryptocephalus suspectus*, Baly, Trans. Ent. Soc. Lond. (3) iv. i. 1865, p. 73. Borneo.

56. *Cœnobius solida.*

**Inclica solida*, Walker, Ann. & Mag. Nat. Hist. (3) iii. 1859, p. 53. Ceylon.
Cœnobius insularis, Weise, Deutsch. ent. Zeit. 1903, p. 219. „

This was noted by Waterhouse in the 'Record' for 1876 under Byrrhidæ, but is omitted in Junk's Cat. 1913.

Inclica, Walk., 1859, is a synonym of *Cœnobius*, Suff., 1857.

Eumolpidæ.

57. *Chrysolampra minuta.*

C.T. *Chrysolampra minuta*, Jac. Ann. Mus. Civ. Gen. xxxii. 1892, p. 894. Burmah.
**Colaspoides lateralis*, Jac. Mem. Soc. Belg. 1900, p. 113. Khasia Hills, India.

58. *Mashonania nigrita.*

**Mashonania nigrita*, Jac. Trans. Ent. Soc. Lond. 1901, p. 247. Natal.
**Casmenella natalensis*, Jac. Proc. Zool. Soc. Lond. 1904, i. p. 266. Natal.

Casmenella, Jac., 1904, is a synonym of *Mashonania*, Jac., 1901.

59. *Alittus foveolatus.*

Alittus foveolatus, Chap. Gen. Col. x. 1874, p. 243. S. Australia.
C.T. *Terillus porosus*, Jac. Proc. Zool. Soc. Lond. 1882, p. 54. Queensland.

60. *Metaxyonycha crucifera.*

**Metaxyonycha crucifera*, Marshall, Ann. & Mag. Nat. Hist. (3) xiii. 1864, p. 384. Brazil.
Metaxyonycha 4-notata, Marshall, Ann. & Mag. Nat. Hist. (3) xiii. 1864, p. 387. Brazil.

61. *Metaxyonycha humilis.*

**Metaxyonycha humilis*, Marshall, Ann. & Mag. Nat. Hist. (3) viii. 1864, p. 387. Amazon.
**Metaxonycha 8-signata*, Baly, Trans. Ent. Soc. Lond. 1881, p. 496. Amazon.

62. *Chalcophana bogotana.*

Chalcophana bogotana, Har. Col. Heft. xii. 1874, p. 78. Colombia.
**Chalcophana opulenta*, Baly, Trans. Ent. Soc. Lond. 1881, p. 499. Colombia.

63. *Typophorus brunneus.*

**Paria brunnea*, Jac. Biol. Centr.-Amer., Col. vi. 1, 1882, p. 183. Panama.
**Typophorus apiciformis*, Jac. Biol. Centr.-Amer., Col. vi. 1, Suppl. 1891, p. 237. Panama.

64. *Myochrous melancholicus.*

**Myochrous melancholicus*, Jac. Biol. Centr.-Amer., Col. vi. 1, 1882, p. 174. Mexico.
**Myochrous carinatus*, Jac. Biol. Centr.-Amer., Col. vi. 1, Suppl. 1891, p. 236. Mexico.

65. *Cleorina basalis.*

**Cleorina basalis*, Baly, Trans. Ent. Soc. Lond. (3) iv. ii. 1867, p. 238. Java.
C.T. *Cleorina modigliani*, Jac. Ann. Mus. Civ. Gen. xxxvi. 1896, p. 413. Sumatra.

66. *Cleorina bella.*

C.T. *Nodostoma bella*, Jac. Ann. Mus. Civ. Gen. xxxii. 1892, p. 895. Burmah.

67. *Colaspoides quadripartita.*

**Colaspoides quadripartita*, Baly, Trans. Ent. Soc. Lond. (3) iv. ii. 1867, p. 152. Singapore.
**Colaspoides brevicollis*, Jac. Ann. Soc. Ent. Belg. xlii. 1898, p. 361. Borneo.

68. *Colaspoides pulchella.*

**Colaspoides pulchella*, Clark, Ann. & Mag. Nat. Hist. (3) xv. 1865, p. 142. Penang.
**Colaspoides cœrulescens*, Baly, Trans. Ent. Soc. Lond. (3) iv. 1867, p. 144. Malacca.

69. *Geloptera femoralis.*

C.T. *Dermorrhytis femoralis*, Jac. Ann. Mus. Civ. Gen. xx. 1884, p. 229. N. Queensland.

Closely allied to *G. miracula*, Lea.

Chrysomelidæ.

70. *Paropsis marmorea.*

Paropsis marmorea, Ol. Ent. v. 1807, p. 599. Victoria.
**Paropsis colorata*, Blkb. Trans. Roy. Soc. S. Aust. xviii. 1894, p. 225. Queensland.

71. *Paropsis irrorata.*

Paropsis irrorata, Chap. Ann. Soc. Ent. Belg. xx. 1877, p. 69. N.W. Australia.
**Paropsis cassiope*, Blkb. Trans. Roy. Soc. S. Aust. xviii. 1901, p. 172. W. Australia.

72. *Trachymela seriata.*

Trachymela seriata, Germ. Linn. Ent. iii. 1848, p. 234. S. Australia.
**Trachymela tatei*, Blkb. Proc. Linn. Soc. N.S.Wales, xxi. p. 656. Victoria.

73. *Trachymela spilota.*

Trachymela spilota, Chap. Ann. Soc. Ent. Belg. xx. 1877, p. 94. Australia.
**Trachymela cribrata*, Blkb. Proc. Linn. Soc. N.S.Wales, xxi. 1896, p. 656. S. Australia.

74. *Algoala sejuncta.*

**Iscadida sejuncta*, Baly, Ent. Month. Mag. xiii. 1876, p. 79. Natal.
**Algoala fulvicollis*, Jac. Proc. Zool. Soc. Lond. 1904, i. p. 268. Cape Colony.

Halticidæ.

75. *Caloscelis jansoni.*

**Notozona jansoni*, Baly, Trans. Ent. Soc. Lond. 1879, p. 238. Peru.

76. *Acrocrypta cumingi.*

**Sphærometopa cumingi*, Baly, Trans. Ent. Soc. Lond. 1876, p. 434. Philippine Is.
Acrocrypta variabilis, Duviv. C. R. Ent. Belg. 1890, p. cxliv. Philippine Is.

77. *Sphærometopa quadripunctata*, Jac.
**Sphærometopa obsoleta*, Jac.
**Sphærometopa intermedia*, Jac.
} Belong to genus *Acrocrypta*, Baly.

78. *Imolia ornata.*

**Sphærometopa ornata*, Baly, Trans. Ent. Soc. Lond. 1876, p. 433. Java.
C.T. *Imolia nigrofasciata*, Jac. Notes Leyd. Mus. vi. 1884, p. 32. Sumatra.

79. ***Xuthea metallica.***

**Pseudodera metallica*, Jac. Ann. Soc. Ent. Belg. xl. 1896, p. 267. India.

80. ***Arsipoda bicolor.***

**Arsipoda bicolor*, Waterh. Trans. Ent. Soc. Lond. i. ser. 2, 1838, p. 132. N.S.Wales.
**Arsipoda languida*, Blkb. Trans. Roy. Soc. S. Aust. xx. 1896, p. 46.

81. ***Poëphila zambiensis.***

**Crepidodera zambiensis*, Jac. Proc. Zool. Soc. Lond. 1899, p. 349. W. Africa.

82. ***Agasicles connexa.***

Systena connexa, Boh. Res. Eugen. 1858, p. 191. Brazil.
**Agasicles vittata*, Jac. Proc. Zool. Soc. Lond. 1904, ii. p. 401. Peru.

83. ***Caloscelis nigripennis.***

**Plectrotetra nigripennis*, Jac. Biol. Centr.-Amer., Col. vi. 1, Suppl. 1891, p. 264. Mexico.

84. ***Nephrica bifasciata.***

**Asphæra bifasciata*, Clark, Journ. of Ent. ii. 1865, p. 382. Brazil, Ega.
**Nephrica staudingeri*, Jac. Proc. Zool. Soc. Lond. 1902, p. 195. Amazon.

85. ***Disonycha sallei.***

**Œdionychis sallei*, Baly, Ann. & Mag. Nat. Hist. (3) iv. 1859, p. 274. Mexico.
**Disonycha sallei*, Jac. Biol. Centr.-Amer. vi. 1884, p. 308. „

86. ***Prasona viridis.***

**Prasona viridis*, Baly, Journ. of Ent. i. 1861, p. 301. Mexico.
**Systena robusta*, Jac. Biol. Centr.-Amer., Col. vi., Suppl. 1891, p. 282. Mexico.

87. ***Chirodica wollastoni.***

**Chirodica wollastoni*, Baly, Trans. Ent. Soc. Lond. 1876, p. 442. Cape Colony.
**Chirodica fulvicornis*, Jac. Proc. Zool. Soc. Lond. 1900, p. 250. Africa.

88. ***Lactica citrina.***

Lactica citrina, Har. Col. Heft. xiv. 1875, p. 14. New Granada.
**Lactica thoracica*, Jac. Ann. Soc. Ent. Belg. xxxvii. 1893, p. 279. Bolivia.

89. ***Phygasia gabonensis.***

**Lactica gabonensis*. Jac. Entomol. xxvi. 1893, Suppl. p. 100. W. Africa.
Phygasia magna, Weise, Deutsch. ent. Zeit. 1895. p. 338. Ashanti.

90. ***Phygasia marginicollis.***

**Lactica marginicollis*, Jac. Entomol. xxvi. 1893, Suppl. p. 99. W. Africa.

91. ***Phygasia limbata.***

**Phygasia limbata*, Baly, Trans. Ent. Soc. Lond. 1877. p. 290. E. Africa.
Phygasia basalis, Weise, Deutsch. ent. Zeit. 1902, p. 302. ,,

92. ***Aphthona scutellata.***

**Longitarsus scutellatus*, Baly, Trans. Ent. Soc. Lond. 1877, p. 177. N. Queensland.
**Aphthona cowleyi*, Blkb. Trans. Roy. Soc. S. Aust. 1896, p. 76. N. Queensland.

93. ***Aphthona wallacei.***

**Aphthona wallacei*, Baly, Trans. Ent. Soc. Lond. 1877, p. 178. Flores.
**Allomorpha glabrata*, Jac. Ann. Mus. Gen. xxxvi. 1896, p. 457. Sumatra.

94. ***Homophyla mœrens.***

**Aphthona mœrens*, Baly, Trans. Ent. Soc. iii. ser. 2, 1865, p. 343. Brazil.

95. ***Luperomorpha flaviventris.***

**Phyllotreta flaviventris*, Jac. Ann. Soc. Ent. xl. 1896, p. 257. India.
**Luperomorpha weisei*, Jac. Ann. Soc. Ent. Belg. xlii. 1898, p. 189. India.

96. ***Phyllotreta bombayensis**, Jac.
**Phyllotreta birmanica*, Jac.
***Phyllotreta discoidea**, Jac.
**Phyllotreta funesta*, Baly.
} Belong to genus *Luperomorpha.*

97. ***Chætocnema æneonigra.***

**Dibolia æneonigra*, Waterh. Trans. Ent. Soc. Lond. ii. 1838, p. 135. W. Australia.
**Chætocnema laticollis*, Baly, Trans. Ent. Soc. Lond. 1877, p. 316. W. Australia.

98. ***Chætocnema fuscomaculata.***

**Chætocnema fuscomaculata*, Baly, Trans. Ent. Soc. Lond. 1877, p. 174. W. Australia.
**Chætocnema tumbeyensis*, Blkb. Trans. Roy. Soc. S. Aust. xx. 1896, p. 63. S. Australia.

99. *Chætocnema ochracea.*

**Dibolia ochracea*, Waterh. Trans. Ent. Soc. Lond. ii. 1838, p. 135. W. Australia.
**Chætocnema crassipennis*, Blkb. Trans. Roy. Soc. S. Aust. xx. 1896, p. 66. S. Australia.

100. *Chætocnema ænea.*

**Dibolia ænea*, Waterh. Trans. Ent. Soc. Lond. ii. 1838, p. 134. N.S.Wales.

101. *Chætocnema subænea.*

**Dibolia subænea*, Waterh. Trans. Ent. Soc. Lond. ii. 1838, p. 135. W. Australia.

102. *Asphæra chontalensis.*

**Asphæra chontalensis*, Jac. Biol. Centr.-Amer., Col. vi. i. p. 403 (1885). Nicaragua.
**Asphæra femorata*, Jac. Proc. Zool. Soc. Lond. 1905, p. 400. S. America.

103. *Aspicela viridicollis.*

**Asphæra viridicollis*, Jac. Proc. Zool. Soc. Lond. 1905, p. 415. S. America.

104. *Nephrica nigripennis.*

**Asphæra nigripennis*, Clark, Journ. of Ent. ii. 1866, p. 381. Amazon.

105. *Asphæra boliviana.*

C.T. *Œdionychis boliviana*, Jac. Ann. Soc. Ent. Belg. xxxvii. 1893, p. 280. Bolivia.

106. *Asphæra æmula.*

Asphæra æmula, Illig. Mag. vi. 1807, p. 130. New Granada.
**Œdionychis bifasciata*, Baly, Ann. & Mag. Nat. Hist. (3) iv. 1859, p. 274. Amazons.

107. *Nephrica quadrimaculata.*

**Asphæra quadrimaculata*, Clark, Journ. of Ent. ii. p. 382. Amazon.

108. *Homophœta lacerata.*

**Asphæra lacerata*, Jac. Proc. Zool. Soc. Lond. 1905, p. 414. Brazil.

This is probably only a bad specimen of *H. 6-notata*, Har.

109. *Physonychis viridipennis.*

Physonychis viridipennis, Dalm. Analect. ent. 1823, p. 77. W. Africa.
**Physonychis dohrni*, Jac. Stett. ent. Zeit. lxiv. p. 309 (1903). „

110. **Physonychis smaragdina*, Clark, Cat. Haltic. p. 31, t. i. fig. 8.

I think there is no doubt that *P. smaragdina*, Clk., has been wrongly sunk as a synonym of *P. viridipennis*, Dalm., in Gemminger's Catalogue. The descriptions do not agree, and there is a specimen in Baly's collection named *P. viridipennis*, Dalm., distinct from Clark's type. Clark's description of the ♀ is wrong, the antennæ are distinctly shorter, and the colour of the elytra is the same as in the ♂. *P. smaragdina*, Clk., is, I think, very close to *P. elongata*, Weise.

111. *Pentamesa haroldi.*

**Argopus haroldi*, Baly, Trans. Ent. Soc. Lond. 1876, p. 439. India.

112. *Sphæroderma apicicornis.*

**Sutrea apicicornis*, Jac. Ann. Soc. Ent. Belg. xlii. 1898, p. 375. Borneo.

113. *Euphitrea wallacei.*

**Euphitrea wallacei*, Baly, Trans. Ent. Soc. Lond. 1875, p. 28. Java.
**Euphymasia dohrni*, Jac. Ent. Zeit. Stet. lx. 1899, p. 311. Sumatra.

Euphymasia, Jac., 1899 (Galerucidæ), = *Euphitrea*, Baly, 1875 (Halticidæ).

114. *Euphitrea subglobosa.*

**Coccinella subglobosa*, Hope, Gray's Zool. Misc. 1831, p. 31. India.

115. *Argopistes pallida.*

**Acrocrypta pallida*, Baly, Ent. Month. Mag. xiii. 1877, p. 224. Sumatra.

116. *Licyllus albicollis.*

**Altica albicollis*, F. Syst. Ent. 1775, p. 112. Australia.
C.T. *Licyllus splendidus*, Jac. Proc. Zool. Soc. Lond. 1885, p. 928. Australia.

117. *Philopona fulvicollis.*

Galleruca fulvicollis, F. Ent. Syst. ii. 1777, p. 29.
**Chrysomela fulvicollis*, F. Spec. Ins. 1781, p. 133. Africa.
**Œdionychis africana*, Jac. Proc. Zool. Soc. Lond. 1894, p. 628. „

Galerucidæ.

118. *Oïdes typographica.*

Oïdes typographica, Rits. Tijds. Ent. xviii. 1875, p. 21. Guinea.
**Oïdes cribellata*, Jac. Nov. Zool. i. 1894, p. 526. W. Africa.

119. *Oïdes costata*, Baly, var. *diabolica*, Weise, Archiv für Nat. 1902, p. 137. Nyasaland.

**Oïdes funebris*, Jac. Ann. Soc. Ent. Fr. 1908, p. 520. ,,

120. *Aulacophora quadripartita.*

Triaplatys quadripartita, Fairm. Journ. Mus. Godeff. xiv. 1878, p. 113. Duke of York Is.

C.T. *Aulacophora fraudulenta*, Jac. Ann. Mus. Gen. (2) iv. 1886, p. 52. N. Guinea.

121. *Aulacophora hilaris.*

Aulacophora hilaris, Boisd. Voy. Astrol., Col. 1835, p. 555. Australia.

**Aulacophora richmondensis*, Blkb. Proc. Linn. Soc. N.S.W. (2) v. 1890, p. 360. N.S.Wales.

122. *Diacantha thomsoni.*

**Idacantha thomsoni*, Jac. Deutsch. ent. Zeit. 1895, p. 182. W. Africa.

**Lætana violaceipennis*, Jac. Stett. ent. Zeit. lxiv. 1903, p. 317. ,,

123. *Sonchia sternalis.*

Aulacophora sternalis, Fairm. Ann. Soc. Ent. Fr. 1888, p. 202. S. Africa.

**Hyperacantha pectoralis*, Jac. Nov. Zool. i. 1894, p. 526. ,,

124. *Hyperacantha flavonigra.*

Galerucella flavonigra, Thoms. Arch. Ent. ii. 1858, p. 218. Gaboon.

**Hyperacantha 4-maculata*, Jac. Deut. ent. Zeit. 1895, p. 182. W. Africa.

125. *Hyperacantha hypomelæna.*

Galerucella hypomelæna, Thoms. Arch. Ent. ii. 1858, p. 219. Gaboon.

126. *Hyperacantha unifasciata.*

Aulacophora unifasciata, Oliv. Ent. vi. 1808, p. 622, t. ii. fig. 20. Madagascar.

**Hyperacantha madagascariensis*, Jac. Ent. xxiv, 1891, Suppl. p. 40. Madagascar.

127. *Bonesia serricornis.*

Ootheca serricornis, Thoms. Arch. Ent. ii. 1858, p. 216. Gaboon.

128. *Agelastica melanocephala.*

Crioceris melanocephala, F. Syst. Ent. 1775, p. 119. Australia.

Monolepta melanocephala, F. Cat. Gemm. & Har. ,,

**Agelastica melanocephala*, Baly, Ann. & Mag. Nat. Hist. (5) iv. 1879, p. 109. Australia.

129. *Eriosarda*, Jac., 1903 = *Mimastracella*, Jac., 1903.

130. *Mimastracella hirsuta.*

**Mimastracella hirsuta*, Jac. Ann. Soc. Ent. Belg. xlvii. 1903, p. 120. Nilgiri Hills.
**Eriosarda metallica*, Jac. Ann. Soc. Ent. Belg. xlvii. 1903, p. 121. Nilgiri Hills.

131. *Cneorane 6-lineata.*

**Cistela 6-lineata*, F. Spec. Ins. i. 1781, p. 149. S. Africa.
**Megalognatha bohemani*, Baly, Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 418. S. Africa.
**Cneorane foveicollis*, Jac. Trans. Ent. Soc. Lond. 1903, p. 27. „

132. *Megalognatha festiva.*

**Cistela festiva*, F. Spec. Ins. i. 1781, p. 148. S. Africa.
**Megalognatha elegans*, Baly, Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 416. S. Africa.
**Apophylia elegantula*, Jac. Ent. xxiv., Suppl. 1891, p. 39. „

133. *Cneorane rubricollis.*

**Galeruca rubricollis*, Hope, Gray's Zool. Misc. 1831, p. 29. India.
**Cneorane fulvicollis*, Baly, Ent. Month. Mag. ii. 1865, p. 97. „

134. *Kanarella pallida.*

**Cneorane pallida*, Jac. Proc. Zool. Soc. Lond. 1887, p. 113. Ceylon.

135. *Luperus australis.*

C.T. *Luperus australis*, Jac. Ann. Mus. Gen. (2) iv. 1886, p. 63. N. Australia.
C.T. *Monolepta germari*, Jac. Ann. Mus. Gen. (2) iv. 1886, p. 92. N. Australia.

136. *Mesotoma*, Jac., 1903 = *Therpis*, Weise, 1900.

137. *Therpis smaragdina.*

Therpis smaragdina, Weise, Deut. ent. Zeit. 1900, p. 456. E. Africa.
**Mesotoma viridipennis*, Jac. Stett. ent. Zeit. lxiv. 1903, p. 328. E. Africa.

138. *Hystaspes*, Jac., 1903 = *Schematizella*, Jac., 1888.

139. *Schematizella viridis.*

Schematizella viridis, Jac. Trans. Ent. Soc. Lond. 1888, p. 203. Cameroons.
**Hystaspes dohrni*, Jac. Stett. ent. Zeit. lxiv. 1903, p. 321. „

140. *Mesodonta marginata.*

**Mesodonta marginata*, Baly, Ann. & Mag. Nat. Hist. (5) iv. 1879, p. 111. Cameroons.
C.T. *Pachytoma suturalis*, Jac. Notes Leyd. Mus. vi. 1884, p. 231. Congo.

141. *Nicea pulchella.*

**Nicea pulchella*, Baly, Trans. Ent. Soc. Lond. 1886, p. 35. New Guinea.
C.T. *Nicea bifasciata*, Jac. Ann. Mus. Gen. (2) iv. 1886, p. 67. New Guinea.

142. *Gastroides purpurascens.*

**Galeruca purpurascens*, Hope, Gray's Zool. Misc. 1831, p. 29. N. India.

143. *Merista quadrifasciata.*

**Haplosonyx 4-fasciata*, Hope, Gray's Zool. Misc. 1831, p. 28. Nepal.
Merista interrupta, Redt. Hüg. Kaschm. iv. 1848, p. 554. Kashmir.

144. *Merista trifasciata.*

**Merista trifasciata*, Hope, Gray's Zool. Misc. 1831, p. 28. Nepal.
Merista variabilis, Har. Stett. ent. Zeit. xli. 1880, p. 142. N. India.

145. *Luperodes alboplagiatus.*

Luperodes alboplagiatus, Mot. Etud. Ent. 1858, p. 102. Ceylon.
**Luperus nigromarginatus*, Jac. Proc. Zool. Soc. Lond. 1887, p. 112. Ceylon.

146. *Monolepta rubricosa.*

Monolepta rubricosa, Gerst. Wiegm. Arch. 1871, i. p. 83. Zanzibar.
**Monolepta nigro-ornata*, Jac. Stett. ent. Zeit. lx. 1899, p. 375. Natal.

147. *Monolepta* (*Candezea*) *basalis.*

Monolepta basalis, Har. Monath. Berl. Akad. 1880, p. 269. Zanzibar.
Monolepta vulgaris, All. Le Nat. (2) ii. 1888, p. 270. „
**Candezea pectoralis*, Jac. Proc. Zool. Soc. 1899, p. 379. S. Africa.

148. *Monolepta cavipennis.*

**Monolepta cavipennis*, Baly, Cist. Ent. ii. 1878, p. 459. Assam.
**Candezea trifasciata*, Jac. Mem. Soc. Ent. Belg. vii. 1900, p. 139. India.

149. *Monolepta* (*Candezea*) *oculata.*

**Crioceris oculata*, F. Spec. Ins. i. 1781, p. 154. Australia.
**Candezea bimaculata*, Jac. Ann. Mus. Gen. (2) iv. 1886. New Guinea.
**Candezea sculpta*, Blkb. Trans. Roy. Soc. S. Aust. xx. 1896, p. 89. Queensland.

150. *Monolepta obesa.*

**Luperodes obesa*, Jac. Ann. Soc. Ent. Belg. xlviii. p. 398. India.

151. *Monolepta* (*Candezea*) *violacea.*

**Candezea violacea*, Jac. Nov. Zool. 1894, p. 531. Cameroons.
**Barombia metallica*, Jac. Stett. ent. Zeit. lxiv. 1903, p. 325. „

152. *Monolepta javanensis.*

C.T. *Luperodes javanensis*, Jac. Notes Leyden Mus. ix. 1887, p. 234. Java.

153. *Metellus*, Jac., Sept. 1886 = *Nacrea*, Baly, March 1886.

154. *Nacrea fulvicollis.*

C.T. *Neocharis fulvicollis*, Jac. Proc. Zool. Soc. Lond. 1881, p. 448. Java.
**Nacrea maculatus*, Baly, Trans. Ent. Soc. Lond. 1886 (March), p. 29. Java.
Metellus fulvicollis, Jac. Ann. Mus. Gen. (2) iv. 1886 (Sept.), p. 62. Java.

155. *Ænidea facialis.*

**Ænidea facialis*, Baly, Journ. Linn. Soc. xx. 1886, p. 27. Ceylon.
**Neochrolea cavifrons*, Jac. Proc. Zool. Soc. Lond. 1887, p. 117. „

156. *Ænidea pretoriæ.*

**Ænidea pretoriæ*, Gah. Nat. Trans. 1892, p. 209. Pretoria, Transvaal.
**Ænidea imitans*, Jac. Ann. & Mag. Nat. Hist. (7) i. 1898, p. 357. Barberton, Transvaal.

157. *Metrioidea apicalis.*

C.T. *Metrioidea apicalis*, Jac. Notes Leyden Mus. vi. 1884, p. 226. Sumatra.
**Nadrana bella*, Baly, Trans. Ent. Soc. Lond. 1886, p. 31. „

IX.—*Brooding-habits of a Cephalopod.*

By W. K. Fisher, Hopkins Marine Station, California.

[Plate V.]

The small octopus*, the publication of whose portrait is the incentive for these notes, was captured off the Hopkins Marine Station, near the south point of Monterey Bay, late in June 1922. It lived in an aquarium for three and one-half months, feeding irregularly and usually at night upon pieces of fish and of the large gastropod *Haliotis*.

* Dr. S. S. Berry, of Redlands, California, writes that the identification of this specimen has presented considerable difficulty. It is probably *Polypus apollyon*, Berry. It very evidently belongs to the *apollyon-konykongensis* group.

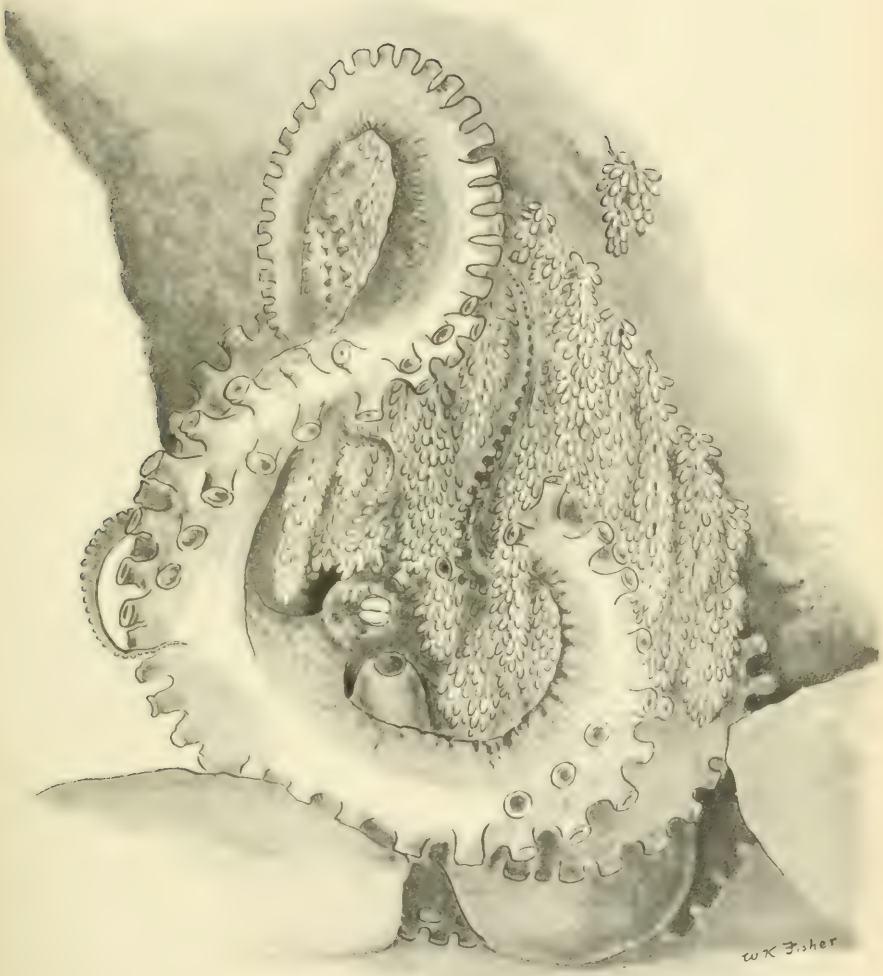
For reference in conversation, the octopus was named "Mephisto," later changed for obvious reasons to "Mephista." She had a little shelter of stones in a front corner of the aquarium. A movable board was so arranged as to exclude all but dim light, since in the language of animal behaviorists an octopus is negatively phototactic (unless, perchance, it is too hungry to care).

During the night of July 4 two or three festoons of eggs were deposited on the sloping underside of the granite roof of Mephista's retreat. These eggs were nearly transparent, and resembled a long bunch of sultana grapes in miniature. The central axis, consisting of the twisted peduncles of the eggs, was brown. During the following week about forty other clusters were deposited, always at night. The process was never observed.

In the meantime, she had assumed the brooding position shown in the accompanying drawing (Pl. V.). This posture was maintained until October 11, when she died. The masses of eggs rested against the dorsal surface of the body and the arms were curled backwards to form a sort of basket or receptacle. Sometimes the skin along the proximal part of the arms was expanded, so as to hide the eggs and to cover her eyes. While the drawing was being made, the ends of the arms were in frequent gentle movement over the clusters and among them—almost a combing motion. This and the restlessness of the funnel, combined with poor light, made it impossible to secure a photograph.

Mephista was never observed away from the eggs during the day, unless badly irritated. If a morsel of fish or abalone (*Haliotis*) was dropped close to her she endeavoured to blow it away with water from the funnel. If this were not sufficient she caught the food in one or two arms and dropped it as far as she could reach. If then the fish was returned she flushed reddish brown, seized the offending morsel, crawled irritably out of her little cell, and, with a curious straightening movement of all the tentacles, fairly hurled the food from her. She then quickly returned to the eggs. In the morning the rejected food would be found partly eaten. A small live abalone kept in the aquarium was not molested. Her reaction to the brooding complex reminded one strongly of the nervous solicitude of most birds for their nest and eggs.

Although the eggs were laid in early July they showed no signs of development for nearly a month. By August 20 the embryos were well advanced and their chromatophores were contracting and expanding. From time to time



POLYPUS APOLLYON, BERRY, nat. size.

bunches of eggs had been removed for preservation, without causing unusual reactions on Mephista's part. About ten bunches were left. They hatched during my absence from the laboratory near the middle of September. On my return, October 1, Mephista was still covering the remains of her brood—the dilapidated clusters of empty egg-capsules. She refused to eat either fish or abalone, and had become noticeably smaller. On October 11 she was found dead at her post.

Whether this curious fidelity was normal or a case of instincts upset by a strongly modified environment, one can only surmise.

Pacific Grove, California.

EXPLANATION OF PLATE V.

Polypus apollyon, Berry. Natural size. Shown in brooding position. The eggs are ellipsoids, about 3 mm. in length, and nearly transparent when first deposited.

X.—*Nematodes of the Genus* Strongyluris *from* Agama. By E. A. Spaul, B.Sc., Birkbeck College, University of London.

A collection of Nematodes sent by Mr. A. Loveridge from Tanganyika Territory to the British Museum for examination was found to contain some forms of *Strongyluris* from various species of *Agama*, a genus of lizards. One was a new species —the largest yet described,—and the others were found, after careful examination and comparison, to be *S. brevicaudata* (Müller). A detailed description is given here of the new species, and a review of the references in literature to *S. brevicaudata*, and conclusions, drawn after comparison with present specimens, recorded.

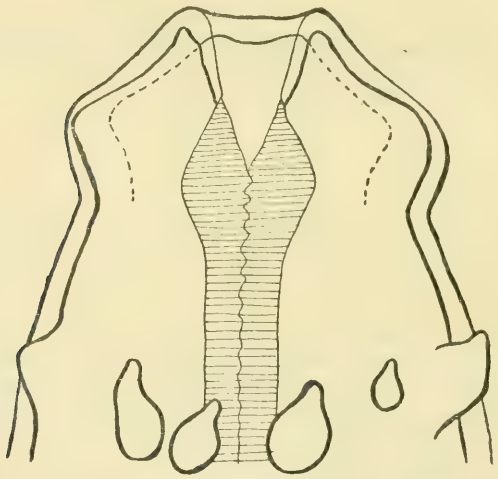
The work was done at Birkbeck College, University of London, and the British Museum, and my thanks are due to Dr. H. A. Baylis for help and for his courtesy in enabling me to examine the material.

Strongyluris loveridgei, sp. n.

This species was found in the oviduct of an *Agama* considered by Mr. Loveridge to be a new species, and is almost twice the size of the recently described *S. gigas*, to which it

bears a striking resemblance, although comparative measurements and other differences show sufficient cause for regarding it as a new species.

Three characteristic lips bearing two papillæ are present, having marginal extensions of cuticle. The cuticle of the body is very thin and the striations almost imperceptible. The pharynx is separated from the œsophagus by a constriction and ventral kink in the lumen. The œsophagus itself enlarges into a bulb at its posterior end. A crown of very large papillæ is present at the anterior end in the male just behind the lips. In some cases they are very prominent, but they vary, also in regularity and arrangement, there being apparently no definite pattern (see text-fig.). The



Ventral view of anterior end of male, showing cervical papillæ.

lateral fields are well marked, consisting of large cells throughout. The excretory pore and nerve-ring are determined with difficulty. The former seems to be a little way behind the pharynx, and the latter approximately the same distance behind the constriction as the latter is behind the anterior end. The male tail is typical, having the same arrangement of papillæ as in *S. gigas*. The preanal sucker with its chitinous ring is flanked by the first three pairs, the most anterior being small and stalked, whilst the others are large and flask-shaped. The next two pairs are not so large as in *S. gigas*, but are long finger-like processes. The two

pairs of anal papillæ are sessile and very prominent, whilst the remaining three pairs of postanal papillæ are arranged in a triangle of large, blunt, finger-like processes. The terminal spike is small and there is no median papilla. The female tail is very blunt and its two papillæ very small. Another important feature of the male is the unequal size of the spicules, the difference always being in the same proportion. The vulva is in the middle of the body of the female. From it arises the vagina, soon giving rise to two uterine branches, but the further course of these, as in *S. gigas*, is most difficult to follow. The eggs are oval and smooth.

The following table gives the measurements of male and female :—

Sex.	Length.	Width.	Diam. at head.	Diam. at tail.	Length of lips.	Width of lips.	Length of tail.	Tail length.	Pharynx.	Œsophagus.	Œsophagus length.	Width of œsophagus.	Dimensions of bulb.	Excretory pore.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.		mm.	mm.		mm.	mm.	mm.
♂..	58	2	·18	1·3	·07	·126	·18	$\frac{1}{30}$	·36	3·2	$\frac{1}{18}$	·108	·45×·36	·45
♀..	66	2·25	·18	·72	·07	·126	·54	$\frac{1}{122}$	·45	4	$\frac{1}{16·5}$	·108	·41×·31	·57

The female is slightly larger, but everything the sexes have in common exists in the same proportion and the same relative position.

Other measurements are :—

♂. Distance of sucker from posterior end	=	·36 mm.
Length of spicules	=	(*a*) 1·43–1·1 mm., (*b*) 1·22–·9 mm.
Width of spicules	=	·04 mm.
Distance of ring of cervical papillæ from anterior end	=	·13 mm.
♀. Position of vulva	=	32·5 mm. from posterior end.
Dimensions of eggs	=	72 μ×36 μ.

The measurements are taken from average readings of all specimens examined, and on comparison with those of *S. gigas* tabulated in a recent paper (Spaul, 1923), and comparing the

same ratio, there is ample evidence for stating that *S. loveridgei* is a distinct species. The reasons may be summarized as follows:—

(1) Length and thickness compared with other types is much greater:

	Length.		Width.	
	♂.	♀.	♂.	♀.
	mm.	mm.	mm.	mm.
S. loveridgei	58	66	·2	2·25
S. gigas	32	35	1·2–1·5	1·5

(2) Ratios of length of the animal to that of its œsophagus and tail are distinct, and cannot be due to variation:

	Œsophagus. Length.		Tail. Length.	
	♂.	♀.	♂.	♀.
S. loveridgei	$(\frac{1}{18})$	$(\frac{1}{16·5})$	$(\frac{1}{330})$	$(\frac{1}{122})$
S. gigas.....	$(\frac{1}{10})$–$(\frac{1}{12})$	$(\frac{1}{9})$–$(\frac{1}{10})$	$(\frac{1}{125})$	$(\frac{1}{90})$

(3) The tail of the female is more obtuse than in *S. gigas*, and in the male, although the numbers and general arrangement are the same, the greater prominence of the most posterior three pairs of papillæ and the sessile anal papillæ is significant.

(4) The crown of papillæ near the anterior end of the male is a new feature.

(5) Size of the eggs:

S. loveridgei ..... 72 $\mu \times 36\,\mu$.
S. gigas ..... 150 $\mu \times 90\,\mu$.

(6) Unequal size and length of the spicules:

S. loveridgei .. (*a*) 1·43–1·1 mm.
(*b*) 1·22–·9 mm.
S. gigas ..... 1·1 mm. (equal).

Strongyluris brevicaudata.

The specimens here referred to were taken from the stomach and intestine of *Agama hispida distanti*, and another, probably new species, and some from the oviduct of *Agama*, sp. n. Careful measurements were made and ratios obtained as for the species just described. There were no papillæ noticeable

at the anterior end, and the males invariably showed the same arrangement of the caudal papillæ, which is identical with that of *S. gigas*. These details were next compared with those recorded in a recent paper (Spaul, 1923), where measurements of *S. gigas*, *S. brevicaudata* (Müller), and *S. ornata*, as described by (*a*) v. Linstow and (*b*) Gendre, were tabulated. Baylis and Daubney (1922) have suggested that *S. ornata* (v. Linstow, 1897) and *S. streptæsophageus* (Connal, 1912) are synonymous with *S. brevicaudata*.

Müller (1894) describes and figures *S. brevicaudata* as having six pairs of caudal papillæ in the male, whilst Skrjabin's figure (1916, pl. v. fig. 33) appears to show nine pairs.

Connal (1912) mentions three pairs of preanal and six pairs of postanal papillæ in his description of *S. streptæsophageus*. The measurements, given in the table referred to, were taken from material from a West-African lizard, and a careful examination of the tail of the same material on the present occasion showed ten pairs of papillæ arranged as in *S. gigas*, the writer in his previous paper having accepted Connal's statement as correct. This number and arrangement agrees with Gendre's (1909) description for *S. ornata*. Further, the number given by v. Linstow (1897) for *S. ornata* is 22, or 11 pairs, but his figure (fig. 5) shows only 21 papillæ, of which one is median just behind the terminal spike. The existence of this papilla is extremely doubtful, and the arrangement of the remaining ten pairs can be reconciled with that shown by Gendre and confirmed in this paper.

The measurements taken from the present material are within the limits of those given by Gendre (1909) for *S. ornata*, v. Linstow (1897) for *S. ornata*, Müller (1894) for *S. brevicaudata*, and Connal (1912) for *S. streptæsophageus*. Also detailed examination shows that the material agrees entirely with the description by Gendre (1909) of *S. ornata*.

Hence it seems quite justifiable to regard the present material as *S. brevicaudata* (Müller), of which *S. ornata* (v. Linstow), the *S. ornata* of Gendre, and *S. streptæsophageus* (Connal) are synonyms.

References.

Baylis, H. A., and Daubney, R. "Report on the Parasitic Nematodes in the Collection of the Zoological Survey of India." Mem. Ind. Mus. vii. 4, pp. 263–347.

Connal, A. 1912. "Some Nematode Worms from Lagos." Journ. Lond. School Trop. Med. I. iii. pp. 229–237.

Gendre, E. 1909. "Notes d'Helminthologie africaine" (Deuxième Note). Proc.-verb. Soc. Linn. Bordeaux, lxiii. pp. xxxiii–xli.

Linstow, O. von. 1897. "Nemathelminthen Grösstenthiels in Madagascar gesammelt." Arch. f. Naturg. lxiii. 1, pp. 27–34, pls. iv.–v.

Müller, A. 1894. "Helminthologische Beobachtungen an bekannten und unbekannten Entozoen." Arch. f. Naturg. lx. Bd. i. pp. 113–128, pl. vii.

Skrjabin, K. J. 1916. "Parasitic Trematodes and Nematodes etc.' Scientific Results of the Zoological Exped. to Brit. E. Africa and Uganda made by Prof. V. Dogiel and P. Sokolow in the Year 1914. Petrograd. Vol. i. no. 4. [Russian, pp. 1–98; English transl. pp. 99–157.] Pls. i.–x.

Spaul, E. A. 1923. "Notes on some Nematodes from East African Hosts." Ann. & Mag. Nat. Hist. (9) xi. pp. 218–224.

XI.—*A British Semi-marine Spider.*

By W. S. Bristowe, Caius College, Cambridge.

(From the Zoological Laboratory, Cambridge.)

Wootton is a quiet little village in the Isle of Wight near Ryde, and at low tide the creek, to which the village has given its name, is reduced to a narrow winding channel with expanses of mud on either side. On the higher portions, which I ascertained were covered by the high tides on about seven days in each month, quite a collection of hardy halophytic plants grow. Sea-purslane (*Atriplex portulacoides*) is very plentiful, and with it are associated marsh-samphire (*Salicornia*), scurvy grass (*Cochlearia*), sea-lavender (*Statice*), sea-pink (*Armeria*), sea-plantain, and various sedges and grasses (*Carex*, *Festuca*, etc.). Whilst I was examining these, I noticed that a species of wolf-spider, *Lycosa purbeckensis* (F. Camb.), was very plentiful amongst them. That day there happened to be a fairly full tide, and the ground where I had noticed them at the ebb was covered by a foot of water; so I determined to find out where they took refuge. Several members of the wolf-spider family—Lycosidæ—have gained a reputation for being semi-aquatic, in that they live near water and can run over the surface without any difficulty. One or two species are known to escape their enemies by running beneath the surface down plant-stems taking air with them—in fact, I have observed that one species (*Pirata piscatoria*) makes a vertical silken tube, open at both ends, in moss in swamps or at the edges of pools, so that it can escape either from aquatic or terrestrial enemies, if need be. *Lycosa purbeckensis*, our mud-flat species, has been recorded from several localities round the English coast, and I have found it near the sea on the west coast of Scotland; but the northern form is, for some reason, much smaller. *L. monticola*, a very closely allied species, is found in some places a

little further inland, and, in fact, about the only distinguishing feature is the long hairs on the legs of *L. purbeckensis*.

To return to our mud-flat: the following day was sunny, and a lot of the spiders were actively running about, but, as the tide rose, they retreated to the higher portions of the plants. Presently I saw one which I had been watching touch the water several times, like a bather feeling the temperature with his toe before taking the plunge, and then it deliberately walked down the stem of the plant beneath the surface, taking with it a bubble of air, caught by means of its hairy body. I watched several others, and the same thing occurred, and this is, therefore, how they survive the high tide. I was puzzled at first by seeing that they dived long before they were forced to by the submergence of their plant, but this was explained by an individual that got dislodged, for it could not dive without the help of something firm to hold on to, and even the tip of a leaf swaying in the current was not sufficient aid. Although they can run over the surface, they are far more comfortable beneath it, especially in rough weather; so the wisdom of their submerging whilst something firm remains to cling to becomes clear.

On dull days I found the spiders did not even trouble to move for the tide, but simply remained where they were at the roots of the plants, and allowed the water to creep over them. So, when the day is dull they spend a longer period submerged; but experiments showed me that they need have no fear of being drowned. I made several individuals walk down plants placed in sea-water in jars, and then added more water, so that the plants were completely covered and the spiders unable to reach the surface, and on the average I found that their one bubble of air would last them as long as ten hours. (In fresh water they did not seem so happy, and three hours was more like their limit.) Three individuals were submerged for ten hours on two consecutive days without being any the worse for it, and it does not appear to be a very large step for a spider to live permanently below the surface, only coming to the top for air, and for migratory purposes when young, as is the case with the water-spider of our ponds and ditches—*Argyroneta aquatica*. To see to what extent aquatic spiders are adapted or modified for their existence (and I have remarked on the hairy legs of *L. purbeckensis*), I collected land-loving spiders of various families, and forced them under water, making them cling to submerged plants. I found that most of them automatically collected a bubble of air, varying in size according to the hairiness of their bodies, and that they could all live, apparently quite happily, as long as this air lasted. *Tegenaria*

(house-spider), for instance, a member of the family to which *Argyroneta* (the water-spider) and *Desis* (a semi-marine foreign genus) belong, lived in salt-water for ten hours without discomfort. *Amaurobius* (a relation of *Amaurobioides*, another foreigner, which is the only other recorded semi-marine spider) also survived several hours. *Scotophœus* (Drassidæ) was quite happy for about the same period as *Tegenaria*. *Salticus* (Attidæ), *Steatoda* (Theridiidæ), *Pholcus* (Pholcidæ), and *Philodromus* (Thomisidæ), however, showed discomfort almost from the start.

Other Arachnids of an amphibious nature represented at Wootton Creek are, perhaps, not as interesting as our *Lycosa*, for during the high tide they merely shelter in crannies or chinks under stones and elsewhere where air is automatically captured. I found three species of Theridiidæ in such situations (*Œdothorax fuscus*, Bl., *Halorates reprobus*, Camb., and *Cnephalocotes curtus*, Sim.), several mites, and a little pseudo-scorpion (*Chthonius tetrachelatus*, Preyss.), which was enclosed in a silken cell on the under surface of a rock. If we come to think of it, the so-called marine spiders of coral-reefs—*Desis* and *Amaurobioides*—do nothing more than this little *Chthonius*, for they hunt on the rocks at low tide and retire to crevices in the reef as the water rises, closing the entrance with silk.

On this mud-flat insects were represented by various kinds of flies, beetles, bugs, and spring-tails, and crustaceans by crabs, sand-hoppers, and wood-lice; so there was a considerable variety of food available for the spiders. Lycosids are not particular, and will even eat dead food (as one example of this I may mention a *Lycosa pullata*, which I found eating a wasp which I had killed three days previously), so drowned insects may occasionally be devoured. I also found by experiment that *L. purbeckensis* will eat young or small sand-hoppers; so, what at first sight would appear to be an unsuitable habitat, on investigation proves to be a very favourable one, and the abundance of *L. purbeckensis* further shows that this is so.

There is need for further investigation with regard to the methods employed by various Arthropods for surviving submergence in situations similar to the one here described. At high tide I saw no sign of any of them. At low tide they were all to be found at the roots of the plants or running about amongst them. A Saldid bug was running about on the mud and the surface of pools left by the tide.

A beetle—*Harpalus* sp.—was found in a sand-hopper burrow.

XII.—*A new Short-tailed Opossum from Marajó, Amazonia.*

By Oldfield Thomas.

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In 1911 Fräulein Snethlage, then of the Pará Museum, sent to the British Museum a short-tailed opossum from Marajó of the genus *Monodelphis*, which was referred by me to "*Peramys*" *domesticus*, Wagn., an animal she had previously obtained in Ceará and elsewhere. Being a male, the number of its mammæ could not be determined, this number being of systematic importance in the group; *M. domestica* has 4—3—4 or 5—3—5.

Now, however, a female specimen from the same island has been received from Herr W. Ehrhardt, and proves to have only 4—1—4 mammæ, a number found in the otherwise very different *M. brevicaudata*. The Marajó animal is therefore no doubt distinct, and may be described as:—

Monodelphis maraxina, sp. n.

General appearance of *M. domestica*, but mammæ as in *brevicaudata*.

Size medium. Fur close and velvety. General colour above uniform mouse-grey, crown, back, and sides all of this colour. Under surface little lighter, the hairs grey with buffy tips. Cheeks, area round ears, and sides of neck tending to be rufous or buffy. Ears rather shorter than in *domestica*. Hands and feet white. Tail short, markedly shorter than in *domestica*, its basal half-inch only with hairs like the back, the rest almost naked, finely scaly, dark grey above, lighter below. Mammæ 4—1—4 = 9.

Skull without special characteristics.

Dimensions of the type:—

Head and body 120 mm.; tail 80; hind foot 16·2; ear 15.

Skull: condylo-basal length 32; molars $^{1-3}$ 6·2.

Hab. Marajó Island, mouth of the Amazon. Type from Caldeirão. Fräulein Snethlage's specimen from Soure.

Type. Adult female. Original number 121. Collected 21st February, 1923, by W. Ehrhardt.

Distinguished from *M. domestica* by its different mammary formula and its shorter tail with less furry part at base; from *M. brevicaudata* by its grey colour and shorter-haired tail.

XIII.—*On the Ring-tailed Phalanger of South Australia, and a new Rat from North Queensland.* By Oldfield Thomas.

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When working at *Pseudochirus* recently I heard that these animals occurred in South Australia, although the Museum contained none which certainly came from there. On appealing to Prof. Wood Jones, he has, as usual, responded most liberally, sending us two examples from Mount Lofty which he had collected for his own work, but which he has now asked me to work out, as I was interested in the subject.

On examination of these specimens I find that a third example, received in 1888 from a dealer, and said to be from South Australia, but on whose locality doubt had been thrown, proves also to be probably referable to this animal, although its imperfect skull renders its relationship to *Ps. occidentalis* so doubtful that it should, perhaps, be put aside, and Prof. Wood Jones's specimens be alone taken into consideration.

These clearly represent a new form, which, in view of the somewhat near alliance of the Victorian *Pseudochirus*, I should consider to be only subspecifically separable from the older-known animal.

Pseudochirus laniginosus notialis, subsp. n.

Most nearly related to *Ps. l. victoriæ*, but clearer grey, without any suffusion of brown, with scarcely any buffy on the arms and hips, and with much longer white tail-tip.

Size rather small. General colour above clear dark slaty grey, without any suffusion of the brownish tone which is present in other members of this group. Under surface white, the hairs along the middle area white to their roots, laterally with slaty bases. Orbits with blackish rings. Back of ears black, succeeded below by a whitish patch. Outer side of forearms and hind legs grey, very faintly tinged with brownish; inner side contrasted white; hands brown above; feet whitish. Tail slaty greyish, like the back, for its basal 3 inches, then darkening to blackish for about 2 inches, the remainder wholly white, the white part nearly three-fifths of the whole length of the tail.

Skull as in *laniginosus*, with shallow nasal notch and

uninflated supraorbital edges. Teeth about as in specimens representing *victoriæ*, smaller than in the majority of New South Wales *laniginosus*, although there is a puzzling amount of variation in these latter.

Dimensions of the type (measured on the skin) :—

Head and body 255 mm. ; tail 270, its white end 154.

Skull: greatest length 61 ; condylo-basal length 60 ; zygomatic breadth 35 ; nasals 22·7 × 10·5 ; dental length 29 ; length of all four molars 13·1, of ms^{1-3} 10·9.

Hab. South Australia. Type from Aldgate, Mt. Lofty, just east of Adelaide.

Type. Adult male. B.M. no. 23. 5. 11. 1. Collected March 1922. Presented by Prof. F. Wood Jones. Two specimens.

Readily distinguishable from *Ps. l. victoriæ*—which is itself a small-toothed greyish form of *laniginosus*—by its deeper and purer grey colour, its scarcely reddened forearms and hips, and its much longer white tail-tip, in which it rivals the West-Australian *occidentalis*.

The following new Australian rat may also be here described :—

Rattus conatus, sp. n.

Allied to *R. colletti*, but larger.

Fur coarse and in old specimens heavily mixed with spinous hairs, a number of finer and longer white-ended piles on the posterior back ; ordinary hairs 13–14 mm. in length, longer piles 35–37. General colour above grizzled buffy brown, paler and more buffy than in *colletti*, but in old examples the blackish spinous hairs are more numerous and dominate the colour, making it more blackish, as in *colletti*, especially on the posterior back. Under surface dull whitish, the bases of the hairs slaty. Hands and feet whitish. Tail shorter than head and body, rather well covered with short hairs for the greater part of its length, but the end is commonly nearly or quite naked ; black or brownish black throughout ; the underside not lighter than the upper ; about ten scales to the centimetre. Mammæ 3—3=12.

Skull, on the whole, shaped like that of *R. colletti*, quite different from the long low skull of *assimilis*, or that of the forms with greatly inflated bullæ, such as *culmorum* and its allies. Supraorbital ridges well developed, running in old specimens to the back of the parietals. Anteorbital foramina widely open, the plate well projected forwards. Palatal

foramina narrow, extending to the level of the first third of m^1. Bullæ rather large, much larger than in *colletti*.

Incisors of average stoutness, the front surface usually white at the tip in old specimens.

Dimensions of the type (measured in flesh):—

Head and body 170 mm.; tail 143; hind foot 29; ear 22.

Skull: greatest length 38; condylo-incisive length 37·5; zygomatic breadth 20; nasals 14·5; interorbital breadth 4·7; palatilar length 19; palatine foramina 8; length of bullæ 7·8; upper molar series 6·9.

Hab. Northern Queensland. Type from the Annan River, Cooktown.

Type. Old female. B.M. no. 23. 1. 5. 15. Original number 212. Collected 2nd August, 1922, by T. V. Sherrin. Presented by the Godman Exploration Trustees. Ten specimens.

Distinguished from *R. colletti*, which is a native of the Northern Territory, by its larger size and paler general colour. Old specimens, in which the blackish spiny hairs become dominant, appear as dark as in *R. colletti*, but the normal grizzled colour of middle-aged specimens is distinctly paler.

XIV.—*A new* Liothrips *from Trinidad.*

By H. H. Karny, Buitenzorg, Dutch East Indies.

Liothrips urichi, sp. n.

♀ ♂. General colour black, in freshly emerged specimens with rich red hypodermal pigment. Fore tibiæ and all tarsi yellowish brown. Antennæ: first and second joints black, the second one paler towards apex; third joint yellow; fourth greyish yellow, shaded with dark before the apex; fifth segment yellowish grey in basal half or third, then gradually darker, distally dark grey-brown; sixth joint of the same colour, but the yellowish tint restricted to extreme base; seventh and eighth segments dark throughout, brownish black.

Head one and a fourth times as long as wide. Eyes moderately large, not protruding, occupying one-third of the length of head, or nearly so. Cheeks very slightly arched, indistinctly converging backwards, finely granulated, without spines. Postocular bristles a little shorter than eyes, pointed.

Ocelli arranged in a nearly right-angled triangle, the posterior ones touching inner margin of eyes close before its middle; anterior ocellus directed forwards. Vertex not produced.

Antennæ inserted close to the fore margin of eyes, nearly twice as long as head. First segment nearly cylindrical, somewhat wider at base than long; second segment longer than wide, cylindrical, but constricted at base; third segment one and a half times as long as the preceding one, clavate; fourth segment a little shorter, more fusiform, but its widest part beyond the middle; fifth and sixth segments of similar shape, each about as long as fourth, but distinctly narrower; seventh and eighth segments broadly united, together fusiform, slender, the widest part before the middle of seventh; eighth conical.

First segment with a very short hair on inner margin; second segment with a few hair-like bristles before apex and one on inner margin near the base; the following segments with two transverse rows of short weak bristles, the basal row on third segment near the middle, on the following ones distinctly before the middle. The longitudinal apical bristle-row consisting of but two or three bristles, reaching from apex to middle of eighth segment, not continued on the seventh one.

Sense-area of second segment placed behind the middle; sense-cones of the following segments short and slender, hardly perceptible, hyaline; those on fourth segment about twice as long as the distance of their insertion from apex of segment; those on third and fifth segment somewhat shorter, on sixth scarcely overreaching the apex of segment; seventh segment with a median sense-cone close before apex.

Mouth-cone very sharply pointed, reaching the fore margin of pterothorax. Maxillary palpi long and slender, as long as the distance of their insertion from that of labial palpi; second segment about four times as long as the basal one. Labial palpi half as long as the maxillary ones, slender, reaching to the apex of mouth-cone; second segment twice as long as basal one.

Prothorax four-fifths the length of head, widened backwards, across fore coxæ about twice as wide as long. All bristles blunt at apex; postero-lateral ones about two-thirds the length of prothorax; antero-lateral bristles scarcely half as long as the postero-lateral ones; medio-lateral bristles inserted in the middle between antero- and postero-lateral ones, a little longer than the former; antero-marginal bristles about as far distant from each other as from the antero-lateral ones; postero-marginal bristles twice as far distant

from the middle of hind margin as from the postero-lateral ones.

Fore coxæ with a stout bristle, somewhat shorter than the postero-lateral ones of prothorax; fore femora of both sexes not enlarged, set with some short hair-like bristles on outer margin throughout the whole length, and with a longer hair on inner margin near base; tibiæ with a similar one before apex; tarsus without tooth in both sexes.

Pterothorax scarcely wider than long, with rounded fore angles; sides arched, somewhat converging posteriorly. Apical suture of mesosternum straight, transverse, reaching to the middle coxæ; in the middle a small equally-sided triangle apposed, from whose apex runs a short median suture forward. Metasternal sutures Λ-shaped, not reaching the hind coxæ. Middle and hind legs slender, moderately long, hind tibiæ distinctly longer than the middle ones; chætotaxy as in the fore legs.

Wings reaching to the base of sixth abdominal segment, not narrowed in the middle, equally wide throughout the whole length, clear or nearly so, without darker markings, except the extreme base of fore wings, which is dark brown. The three subbasal bristles placed on a nearly straight line, about equal in length, blunt at apex; the second bristle somewhat more distant from the first than from the third. Hind margin of fore wings with six to ten duplicated cilia.

Abdomen one and a half times as wide as pterothorax, in ♀ widest behind the middle, in ♂ near the base; segments 2–9 with two long bristles near the hind angles, on seventh and eighth as long as the segment itself, on the preceding ones shorter, on ninth about as long as tube. Wing-retaining spines short and weak; hind pair on segments 4 and 5 somewhat shorter than the distance of their apices, on the others still shorter; fore pair on each segment shorter and weaker than the hind pair of the same segment. Tube about five-sixths the length of head, a little more than twice as long as wide at base, at apex half as wide as at base; sides nearly straight, near the apex more converging than in basal two-thirds; terminal bristles sharply pointed, hair-like in distal half, the longer ones about two-thirds the length of tube, the shorter ones a little longer than one-third of the others.

Measurements (*in millimetres*).— ♀. Total length of antennæ 0·49; first joint 0·04 long, 0·045 wide; second joint 0·05 long, 0·035 wide; third joint 0·075 long, 0·03 wide; fourth joint 0·073 long, 0·033 wide; fifth joint 0·075 long, 0·03 wide; sixth joint 0·07 long, 0·03 wide; seventh joint 0·07 long, 0·025 wide; eighth joint 0·035 long, 0·015 wide. Head 0·25 long, 0·19 wide. Prothorax 0·20 long, 0·35 wide

(across fore coxæ). Fore femora 0·21 long, 0·08 wide ; fore tibiæ (incl. tarsi) 0·28 long, 0·05 wide. Pterothorax 0·40 long, 0·42 wide. Middle femora 0·22 long, 0·06 wide ; middle tibiæ (incl. tarsi) 0·29 long, 0·04 wide. Hind femora 0·22 long, 0·06 wide ; hind tibiæ (incl. tarsi) 0·35 long, 0·04 wide. Length of wings 0·85 (without fringe). Abdomen (incl. tube) 1·50 long, 0·46 wide ; length of tube 0·22, width at base 0·09, width at apex 0·04. Total length 1·8–2·6.

♂. Total length of antenna 0·45 ; first joint 0·03 long, 0·035 wide ; second joint 0·05 long, 0·03 wide ; third joint 0·075 long, 0·03 wide ; fourth joint 0·067 long, 0·032 wide ; fifth joint 0·065 long, 0·028 wide ; sixth joint 0·065 long, 0·025 wide ; seventh joint 0·06 long, 0·02 wide ; eighth joint 0·035 long, 0·015 wide. Head 0·24 long, 0·19 wide. Prothorax 0·15 long, 0·34 wide (incl. fore coxæ). Fore femora 0·18 long, 0·07 wide ; fore tibiæ (incl. tarsi) 0·24 long, 0·04 wide. Pterothorax 0·35 long, 0·40 wide. Middle femora 0·18 long, 0·06 wide ; middle tibiæ (incl. tarsi) 0·25 long, 0·04 wide. Hind femora 0·22 long, 0·06 wide ; hind tibiæ (incl. tarsi) 0·30 long, 0·04 wide. Length of wings 0·75. Abdomen (incl. tube) 1·15 long, 0·38 wide ; length of tube 0·20, width at base 0·08, at apex 0·04. Total length 1·5–1·9.

Described from several specimens of both sexes taken by Mr. F. W. Urich in Trinidad, B.W.I., on *Clydemia*, and sent to me by Mr. C. B. Williams (Cairo, Egypt).

I have much pleasure in naming this new species after its discoverer, Mr. F. W. Urich, the active entomologist of Trinidad.

L. urichi may be easily distinguished from all hitherto known species of *Liothrips* by the characters given above. Some species described as *Liothrips* by Hood have a rounded mouth-cone, and may therefore rather belong to *Gynaikothrips*; in every case they are by this character quite different from my new species. Of the numerous American species of *Liothrips*, the majority have black fore tibiæ and more numerous duplicated fringe-hairs on fore wings. *L. citricornis* differs from *urichi* by the aberrant coloration of antennæ. *L. fuscus* has no doubled cilia. *L. ilex* and *sambuci* may be distinguished by their brownish-coloured wings. *L. similis* has the head and third antennal segment much longer.

The European species have the middle and hind tibiæ distally (*hradecensis*, *setinodis*, *vaneeckei*) or entirely (*pragensis*) yellow. The African species have a longer head and dark fore tibiæ. *L. tarsidens* and *trybomi* (nom. nov. for *Liothrips* sp., Trybom, 1910, Voeltzkow, Reise, ii. p. 523) differ by the presence of a large tarsal tooth.

The Australian *brevidens* and the Javanese *longirostris* have

also a tarsal tooth, at least in the ♂. *L. brevitubus* has the wings shaded with brownish and a much shorter tube. *L. glycinicola* (Japan) differs also by its shorter tube and by the different coloration of antennæ. *L. niger* (Schmutz) and *gigas* may be distinguished by their larger size and the much more numerous doubled fringe-hairs. The Australian *priscus* has the eighth antennal segment strongly constricted at base and the wings shaded with brownish; finally, *reuteri* differs by having all three tibiæ pale.

Zoological Museum, Buitenzorg,
February 1923.

XV.—*The Present Position of Darwinism**. By C. Tate Regan, M.A., F.R.S., Keeper of Zoology in the British Museum (Natural History).

Dr. Willis has shown on the screen a passage from my book on British Freshwater Fishes, in which I state that dispersal takes time and proceeds at varying rates according to circumstances. From this he claims me as a supporter of the "age and area" hypothesis. I can only say that I have no knowledge as to the ages of our Cyprinoid Fishes as species, and that I think it probable that as British species they are all of about the same age.

After careful consideration of the "age and area" hypothesis, I have reached the conclusion that it has no value. I must, therefore, give some explanation of Dr. Willis's "hollow curves" and of his "successful predictions."

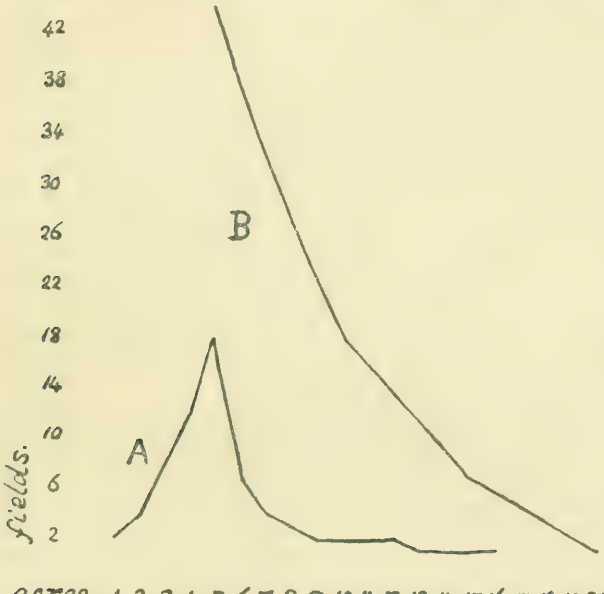
If the values of a series of variates be plotted, a curve may be obtained that is either symmetrical or asymmetrical. The "hollow curve" is an extreme type of asymmetrical curve; there is nothing mysterious about it, and it is quite well known to statisticians. Its close relationship to a less extreme type may be shown by the accompanying diagram, where the curves illustrate the numbers of the fields of different sizes on an imaginary estate. Taking 1 acre as the unit of area the curve A is obtained, but by taking 5 acres as the unit the curve B results.

This example has some importance in relation to Dr. Willis's work, for he claims that the distribution of species may be represented by "hollow curves," whereas it is clear that by

* I have received several requests to publish my contribution to the debate on the present position of Darwinism, which took place at the Hull meeting of the British Association last year. It should be explained that the first hour was occupied by Dr. Willis and Mr. Yule, and I had therefore to devote a considerable part of the twenty minutes at my disposal to the "age and area" hypothesis.

making the unit of area small enough the curves would be of a more normal type.

A well-known "hollow curve" is one representing the people of this country arranged according to their wealth, from many poor to few very rich. Other good examples



Curves illustrating the area of fields on an estate. In A the unit is 1 acre, parts of an acre counting as a whole acre. In B the classes are 5 acres or less, more than 5 but not more than 10 acres, etc. The first five classes in A are added together to make the first class in B, etc.

may be obtained by arranging towns according to their population, or the names in a directory * according to the number of times each appears, etc., etc. Such curves, like those of Dr. Willis, must not be regarded as anything more than

* The curves from the London Telephone Directory are interesting, as they have the same form as those given by Willis for genera of plants. I have not studied surnames, but I suppose the number of Smiths, Weavers, Hawkers, etc., has some relation to the number of people that followed those occupations in former times—similarly, that the number of Robinsons, Robsons, Davidsons, etc., is related to the former popularity of certain Christian names, that names taken from places are mostly not common, etc. In other words, the form of the curve is not due to a single factor.

Bowley ('Elements of Statistics') enumerates some common ways of producing a false statistical argument, the most frequent of which is to argue hastily from effect to cause, and he adds, "Perhaps statisticians have not always fully recognized the limitations of their work."

graphic representations of certain facts, and no more can be got out of them than goes into them. No theory should be based on a curve, and if one wishes to make generalizations the only sound method is to study a large number of the variates, seeking for the causes of their frequency.

I have read in Dr. Willis's book his account of the successful predictions he made with the aid of the "age and area" hypothesis. The first of these was to the effect that if any New Zealand plants were common to the Kermadec, Chatham, and Auckland Islands (respectively to the north, east, and south of New Zealand) they would have a wide range in New Zealand. The matter was investigated, and it was found that there were five species common to all the islands, and that each extended right through New Zealand from north to south. When I read this I felt inspired, and I ventured to prophecy that British plants common to the Orkneys and the Scilly Islands would range throughout Great Britain from Caithness to Cornwall; but before I got to the end of the chapter I found that Dr. Willis had anticipated me, and gave this as a parallel case.

Dr. Willis supports the mutation theory, which has been admirably stated by Bateson * in the following words:—"If the differences between species have not come about by the addition or loss of factors one at a time, then we must suppose that the changes have been effected by even larger steps, and variations including groups of characters must be invoked." This theory, which explains adaptation as the result of a series of fortunate accidents, appears to me to approximate to the old "special creation" theory, and it was in opposing this idea of great and sudden transformations that Darwin † wrote:—"To admit all this is, as it seems to me, to enter into the realms of miracle and to leave those of science."

The mutation theory is in favour with the geneticists, who have found that definite variations occur and are definitely inherited. But the geneticists are puzzled to suggest how these variations could become specific characters, common to all the members of a species, seeing that they are not adaptative, and therefore could not be selected.

Systematists attach little importance to interspecific sterility; they know that Darwin showed that between allied species there are all gradations, from complete sterility to complete fertility. But for the geneticists sterility is all important—it is their one hope of producing the semblance of a species,—and they proclaim that the event for which

* 'Problems of Genetics,' p. 101.

† 'Origin of Species,' p. 191 (ed. vi. 1895).

they are waiting is the production of a variety which is sterile with the parent form. That great event, if and when it occurs, will leave me cold; in my opinion, it will have about as much relation to the origin of species as the occurrence of albinos has to the coloration of Arctic animals—that is to say, no relation whatever!

My own work on the structure, classification, and geographical distribution of fishes, including monographs of several families, has led me to certain conclusions. I believe that the first step in the origin of a new species is not a change of structure, but the formation of a community, either through localization, geographical isolation, or habitudinal segregation. I also think that specific characters may be grouped as follows:—they are either (*a*) useful, (*b*) correlated with useful characters, (*c*) due to the environment, or (*d*) the expression of some physiological peculiarity. But I see no reason for believing that they have originated as mutations.

So much for the "age and area" and "mutation" theories; now, as to the present position of Darwinism. What is Darwinism? First of all, it is the theory of organic evolution. Darwin showed that the facts of structure, classification, development, geographical distribution, and geological succession of animals and plants were intelligible only if there had been evolution. He gave a new impulse to work in these branches, all of which has confirmed his conclusion, so that at the present day we are justified in saying that organic evolution is no longer a theory, but an established fact. In a more restricted sense, Darwinism is Darwin's theory as to how evolution had taken place, and, as very few people seem to read Darwin nowadays, I will give it in his own words. He wrote:—

"I have now recapitulated the facts and considerations which have thoroughly convinced me that species have been modified, during a long course of descent. This has been effected chiefly through the natural selection of numerous successive, slight, favourable variations; aided in an important manner by the inherited effect of the use and disuse of parts; and in an unimportant manner, that is in relation to adaptive structures, whether past or present, by the direct action of external conditions, and by variations which seem to us in our ignorance to arise spontaneously."

That theory was put forward by a man whose knowledge was profound and whose reasoning powers were of the highest order, and it has this great advantage over all other theories—its author knew the facts to be explained, and he explained them.

XVI.—*On the Type of* Monophlebus (Drosicha) contrahens (*Walk.*), *with Description of a new Species from Ceylon.*

By E. Ernest Green, F.E.S., F.Z.S.

[Plates VI. & VII.]

Drosicha contrahens, Walker, Cat. Brit. Mus., Homopt. iv., Suppl. p. 306 (1858).

The unique type of Walker's species, consisting of a dried and pinned specimen, has hitherto been available for superficial study only. It has now been prepared and mounted for microscopical examination. Misled by a superficial examination of the type in its earlier condition, and relying upon Signoret's description of the species from specimens said to have been received from Ceylon, I wrongly determined and described* as *contrahens* a large Monophlebid in my own collection from that island. Subsequent study of the prepared type-specimen of *contrahens* has proved that the two insects are quite distinct. It is now possible to give a more detailed description of this unique type, which may prevent similar mistakes in the future.

The type-specimen is labelled as from "North China." There are no co-types in the collection of the British Museum.

Walker's original description of the species (*loc. cit.*) is as follows:—"Nigricante-picea, albido subtomentosa. Blackish piceous, slightly covered with whitish tomentum. *a*. North China. From Mr. Fortune's collection."

Signoret's description was based on specimens received from Ceylon. It is insufficient for accurate determination, but, so far as it goes, is equally applicable to *Monophlebus phyllanthi* (described below), which is the more common species in Ceylon. I have never taken *contrahens* in that island.

These inadequate descriptions can now be supplemented by the following particulars:—Adult female of the form normal to the genus. Colour of living insect unknown, probably purplish or carneous; even the dried insect (as seen by me) could scarcely be described as "nigricante-picea." Antennæ imperfect, probably 8-jointed when complete; the basal five segments (which alone remain) are shown on Pl. VI. fig. 1; first joint broader than long, with parallel sides; second joint broader than long, tapering slightly towards the distal extremity; third joint longer than broad, cylindrical, obscurely bimodose; fourth and fifth joints with rounded sides, slightly gibbous; all the joints with a few stoutish setæ. Eyes

* Mon. Coce. Ceylon, v. p. 431 (1922).

(Pl. VI. fig. 4) truncately conical. Limbs (represented in the type-specimen by one leg of the third pair only) robust (Pl. VI. fig. 5); claw stout and falcate; tarsus slightly less than half the length of the tibia; tarsus and tibia together approximately equalling the length of the combined femur and trochanter; all the joints with stout setæ, more numerous on the femur, shorter and spiniform on the inner edge of the tibia and tarsus. Thoracic spiracles (Pl. VI. fig. 1) of approximately equal size, the anterior one slightly the smaller; the exterior aperture ovate, surrounded by a broad chitinous flange; without pores in the opening. Abdominal spiracles (Pl. VI. fig. 2) small, simple; the exterior aperture circular; the entrance-chamber (for which I suggest the term "atrium") inwardly expanded, with concentric thickened rings. Anal orifice (Pl. VI. fig. 10) with densely chitinous walls. Derm closely set with stout and longish setæ, more crowded on the margins of the body (Pl. VI. fig. 9) and immediately surrounding the anal orifice; the setæ of approximately equal size on the dorsum (Pl. VI. fig. 7) and venter (Pl. VI. fig. 6); some macro-setæ, of varying size (Pl. VI. fig. 8), with enlarged basal sockets, sparsely distributed on the marginal and submarginal areas, more particularly upon the posterior segments. Pores (see Pl. VI. fig. 7) distributed over the whole surface of the body, rather more crowded on the area surrounding the anal orifice; each pore with a thickened rim, enclosing a central orifice surrounded by a circle of five or six translucent loculi. Dermal cells small, circular, obscure, each associated with either a seta or a pore.

Length 12·5 mm., breadth 8 mm.

"North China. From Mr. Fortune's collection."

Type in Coll. British Museum of Natural History.

Monophlebus (*Drosicha*) *phyllanthi*, sp. n.

Monophlebus contrahens (wrongly determined), Green, Mon. Cocc. Ceylon, v. p. 431 (1922).

? *Drosicha contrahens*, Sign. Ann. Soc. Ent. Fr. (5) v. p. 354 (1875).

Adult female of form normal to the genus. Dull pinkish purple, thinly but closely covered with whitish powdery secretion. Antennæ (Pl. VII. fig. 3) 8-jointed, the joints narrowing to the eighth, which is the longest and equal to or slightly exceeding the combined lengths of the sixth and seventh; second and third approximately quadrate; fifth, sixth, and seventh wider at the distal end; all the joints with a few stoutish setæ. Eyes (Pl. VII. fig. 4) subglobose or roundly conical. Limbs (Pl. VII. fig. 2) robust; claw relatively short, moderately curved, stout and bluntly pointed; tarsus of hind leg approximately one-third the length of the

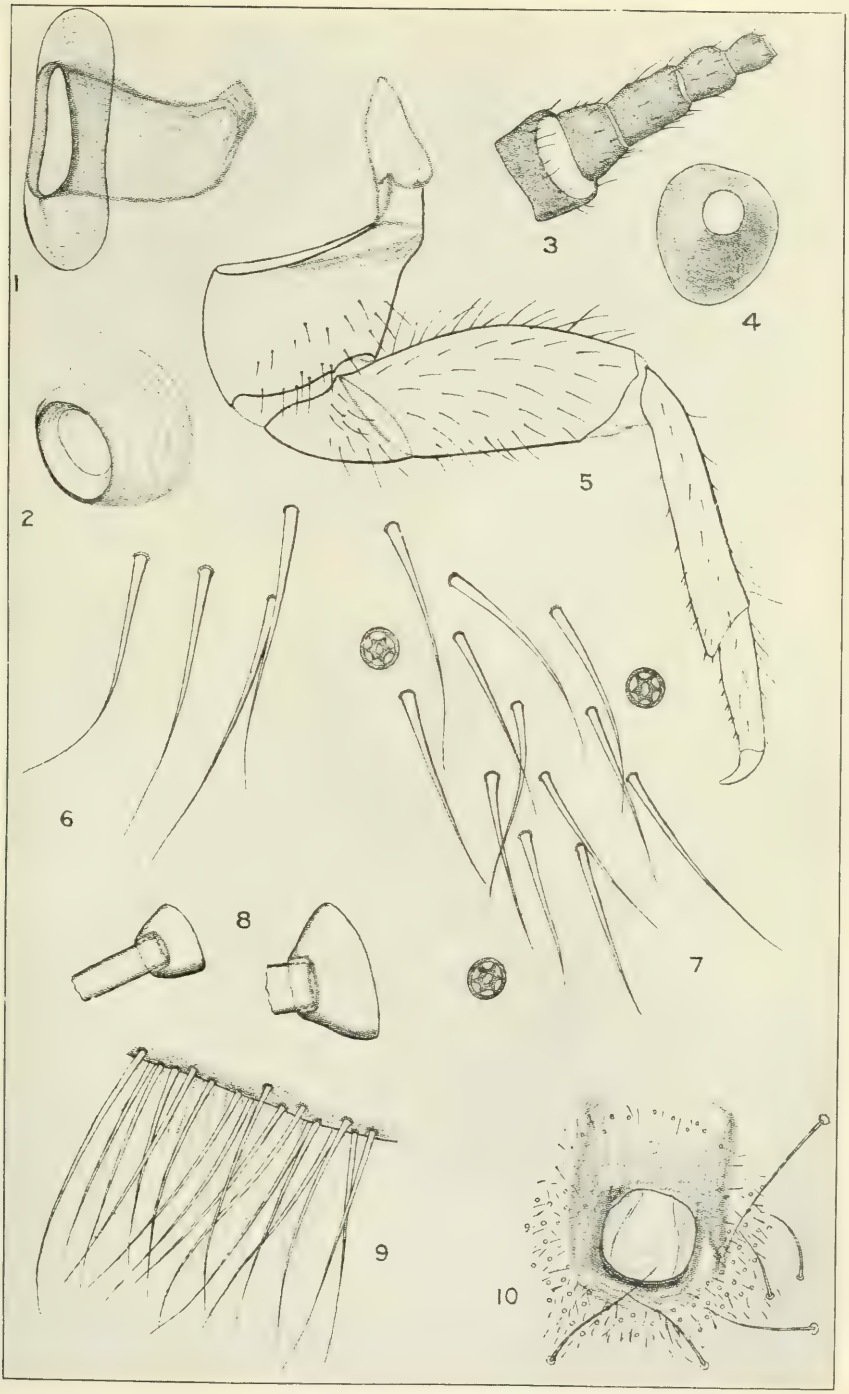
tibia; tarsi of front and mid-legs slightly exceeding half the length of the tibiæ. Thoracic spiracles (Pl. VII. fig. 1) with a conspicuous series of multilocular pores lining the exterior aperture. Abdominal spiracles (Pl. VII. figs. 5, 6) relatively large; the walls of the "atrium" conspicuously studded with multilocular pores. Anal orifice (Pl. VII. fig. 14) surrounded by a group of long stout setæ; the inner extremity of the rectal tube minutely lobulate. Derm closely studded with deep-seated, circular or ovoid, translucent cells, more conspicuous and sharply defined on the dorsum; each cell associated either with a pore or a seta. No ventral cicatrices. Dorsal setæ (Pl. VII. fig. 9) shorter, stout at the base, tapering rapidly to about the middle, the distal half slender. Ventral setæ (Pl. VII. fig. 8) longer and tapering more evenly to the extremity. Marginal setæ (Pl. VII. fig. 13) intermediate in character between those of the dorsum and of the medio-ventral area. Macro-setæ with enlarged and collared bases (Pl. VII. figs. 11, 12) at intervals along the margin, more numerous towards the posterior extremity of the body. Multilocular pores distributed evenly over both surfaces; the central orifices tri- or quadrilobate, the outer circle of loculi varying from four to six, the intervals between the loculi dense, producing a radiate or stellate appearance (see Pl. VII. figs. 9, 10). It must be observed, however, that too much importance should not be attached to apparent differences in the pattern of the pores on different parts of the body, or even in different species. Much depends upon the clarity of the preparation, and the pattern varies also with the depth of the focus at which it is viewed. The vertical view is somewhat illusory and its representation more or less of a compromise. The pore is actually a deep cup-shaped organ, as seen in profile (Pl. VII. fig. 7). The stellate pattern results from thickened ribs on the walls of the cup. The appearance of the vertical and lateral views is so different as to be almost irreconcilable.

Length (of examples from Ceylon) 9–14 mm., breadth 6–9 mm.

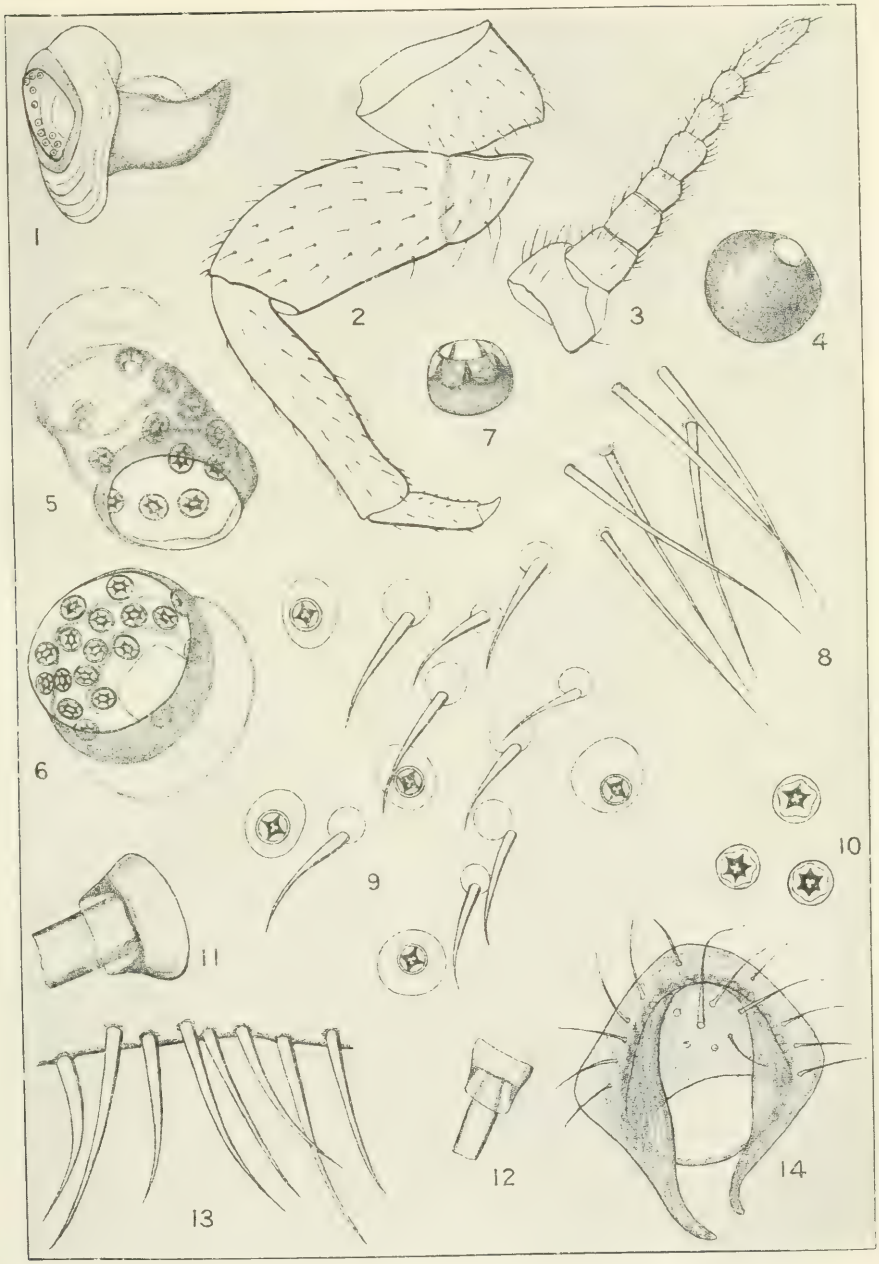
Ceylon; on *Phyllanthus* sp.

Received also from India (Sukkur Forest, Samalkota, Moultan, Bangalore, Calcutta, and Malabar), on *Tamarix*, *Prosopis*, *Croton*, *Gossypium*, *Bombax*, and *Cleistanthus*. Some examples from the Sukkur Forest measure 16 × 10 mm.

The only other Monophlebid in which I have observed conspicuous pores in the atrium of the abdominal spiracles is *M. crawfordi* of Maskell; but examination of recent material of that species leads me to believe that it is referable to the *walkeriana* group rather than to the genus *Monophlebus*.



Monophlebus contrahens.



Monophlebus phyllanthi

EXPLANATION OF THE PLATES.

Plate VI.

Monophlebus contrahens.

Fig. 1. Anterior thoracic spiracle. × 80.
Fig. 2. Abdominal spiracle. × 450.
Fig. 3. Basal joints of antenna. × 30.
Fig. 4. Eye. × 80.
Fig. 5. Hind leg. × 30.
Fig. 6. Ventral setæ, from median area of abdomen. × 450.
Fig. 7. Dorsal setæ and pores, from median area of preanal segment. × 450.
Fig. 8. Bases of enlarged setæ, from posterior margin. × 450.
Fig. 9. Fringe of posterior margin. × 450.
Fig. 10. Anal orifice and surrounding area. × 130.

Plate VII.

Monophlebus phyllanthi.

Fig. 1. Anterior thoracic spiracle. × 80.
Fig. 2. Hind leg. × 30.
Fig. 3. Antenna. × 30.
Fig. 4. Eye. × 80.
Figs. 5, 6. Abdominal spiracles. × 450.
Fig. 7. One of the dermal pores, viewed in profile. × 1000.
Fig. 8. Ventral setæ, from median area of abdomen. × 450.
Fig. 9. Dorsal setæ, dermal cells, and pores, from median area of preanal segment. × 450.
Fig. 10. Other forms of pores, from dorsum. × 500.
Figs. 11, 12. Bases of enlarged setæ, from posterior margin. × 450.
Fig. 13. Fringe of posterior margin. × 450.
Fig. 14. Anal orifice. × 130.

XVII.—*Geographical Races of* Petaurista alborufus.

By Oldfield Thomas.

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Mr. George Forrest, who collected the Li-kiang mammals recently described in the 'Annals,' has now sent from the same district a native skin of a large Flying Squirrel, received by him after his main collection was dispatched. It clearly belongs to the splendid species described by Milne-Edwards under the name of *Pteromys alborufus*, but, on a comparison of all the available specimens of that species, there would appear to be three races of it.

To the Duke of Bedford's exploration of China we owe a skin obtained by Mr. Malcolm Anderson at Pao-Ning-Fu, Northern Sze-chwan, which precisely agrees with Milne-Edwards's figure and description in the bright pale rufous of the general colour, especially on the nape and shoulders, and in the hands and feet being wholly rufous, scarcely darkening on the tip of the digits. White of face reaching to the level of the ears, that of throat extending upwards in front of the

shoulders on to the upper surface. Under surface bright pale rufous, slightly washed with white along the median area.

Contrasted with this, all the other specimens in the Museum are of a deep rich chestnut-colour, and have practically black feet. Two forms would seem to be distinguishable:—

Petaurista alborufus castaneus, subsp. n.

General ground-colour of upper surface deep glossy chestnut; under surface bright rufous, with practically no whitish wash, except for a few white hairs in the inguinal region. Light dorsal patch dull buffy, the extreme tips of the hairs inclining to rufous. White of throat extending prominently on to the upper side of the antebrachial membrane. Hands and feet deep black above, the general chestnut-colour trespassing slightly on the metapodials. Other characters as in *alborufus*.

Hind foot of type 85 mm.

Skull: greatest length 82; cheek-teeth, exclusive of p^3, 17.

Hab. Middle Yang-tze-kiang. Type from Ichang; another from Chung-king.

Type. Adult male. B.M. no. 95. 7. 4. 1. Collected January 1894 by Mr. F. W. Styan. Five specimens.

All the five Yang-tze specimens are remarkably constant in the characters noted, while that sent from Yunnan by Mr. Forrest differs in several respects, and apparently represents yet another definable race.

Petaurista alborufus ochraspis, subsp. n.

General colour above of the same dark chestnut as in *castaneus*. Light dorsal area more extended and considerably lighter than in other forms, buffy whitish. Under surface much washed with white, especially along the middle area; pure white of throat extending to between the fore limbs, but not on to the upper surface of the antebrachial membrane. White of face passing backwards to the nape. Hands and feet as in *castaneus*, but the reddish on the metapodials rather more extended. Light patch at base of tail prominently whitish.

No satisfactory measurements available.

Hab. N.W. Yunnan. Type from the northern end of the Li-kiang Range.

Type. Adult male. B.M. no. 23. 1. 4. 93. Collected by Mr. George Forrest and presented by Col. Stephenson Clarke, C.B.

This race differs by its paler dorsal patch and more whitish-washed underside from *castaneus*, and from true *alborufus* by its deep chestnut general colour and its black feet.

XVIII.—*Notes on some Spiny Mice* (Acomys).

By Oldfield Thomas.

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When determining, in 1895, the small mammals obtained at and near Aden by Col. Yerbury I referred the spiny mice to *Acomys dimidiatus*, a species described from Sinai. Since then a number of specimens of *dimidiatus* from Sinai and Palestine have been obtained by Messrs. Carruthers, Buxton, and others, and all of these have tails little or not exceeding the head and body in length. This, however, is not the case in the Aden series, and these latter appear to be separable subspecifically.

Acomys dimidiatus homericus, subsp. n.

General characters as in true *dimidiatus*, but the colour greyer, especially on the nape, less often becoming rufous in old age. Tail very long, exceeding the head and body by from 10 to 20 mm. and that of *dimidiatus* by about the same amount.

Skull as in *dimidiatus*, though, perhaps, averaging rather longer and less broadened across the brain-case.

Dimensions of the type :—

Head and body 108 mm.; tail 138; hind foot 19; ear 20.

Skull: greatest length 33·3; condylo-incisive length 30; breadth across ridges on brain-case 13; molars 4·6.

Hab. Aden district. Type from El Khaur.

Type. Old female. B.M. no. 99. 11. 6. 77. Original number 96. Collected 6th October, 1889, by W. Dodson. Fifteen specimens examined.

Acomys louisæ, Thos.

This Somali species was described on a specimen which I supposed to be adult, but which, now that the skulls of other specimens of the same type are available, I believe to be immature. It is for this reason no doubt that the fur is less spinous than usual, the adults being as fully spinous as in other *Acomys*. The species, however, is quite a distinct one, characterized by its small size and, in the typical race, its rufous colour and white tail. This rufous typical race inhabits the high reddish-coloured area of Central and Southern Somali, examples being now available from Burao (*Bury*) and Webi Habir (*Ruspoli*), besides the type from the Henweina Plain (*Lort Phillips*).

But on the Wagar Mountain in the Golis Range Mr. G. W. Bury obtained some specimens agreeing in essential characters with *A. louisæ*, but browner and with bicolor tails. These would appear to represent a different subspecies, not of the red soil, and may be called

Acomys louisæ umbratus, subsp. n.

Proportions and skull as in *louisæ*, but the general colour greyish brown, the head and fore back of this colour; the spinous hinder back suffused to a slight extent with buffy, but the whole animal is nothing like the rich buffy, even ochraceous buffy, of true *louisæ*. Tail bicolor, the upper surface greyish brown, the underside contrasted white; in true *louisæ* the tail is practically wholly white.

Dimensions of the type (measured on the spirit-specimen) :—

Head and body 85 mm.; tail 104; hind foot 16; ear 15.

Skull: greatest length 27·3; condylo-incisive length 24; breadth across ridges on brain-case 12·2; nasals 11·3; palatal foramina 6·9; upper molar series 4·2.

Hab. Golis Mountains, N. Somaliland. Type from the Wagar Mountain, about 40 miles S.S.E. of Berbera. Alt. 5000′.

Type. Adult female (skinned from spirit). B.M. no. 5. 11. 4. 20. Collected by G. W. Bury. Eight specimens.

XIX.—*Notes on the Distribution of some West Australian* Asilidæ. By G. H. Hardy, Walter and Eliza Hall Fellow in Economic Biology, University, Brisbane.

Professor W. J. Dakin and Mr. M. G. C. Fordham have recently contributed a paper on West Australian Asilidæ (1) that I cannot allow to pass without special comment upon various remarks therein.

The paper starts with the usually-accepted idea that very little is known about Australian Diptera; and yet we have the Macleay collection, various old specimens in museums, and quite a number of recent collections containing West Australian Diptera from which far more knowledge has been gained than is credited.

The authors remark that "few people in Europe seem to be aware that the State (West Australia) is equal to the United Kingdom, Germany, France, Italy, Norway,

and Spain together. The climatic conditions between the extreme tropical north and the wet-winter country round Albany in the south are more than should be expected from the distance separating the two regions."

Judging by the eastern side of Australia, together with the knowledge gained by comparing specimens from Western Australia, the difference in climatic conditions is not such a big factor controlling the distribution of Australian Diptera as the authors suggest. Some species, like *Asilus inglorius*, are definitely known from all mainland States except the Northern Territory, but reaching the Gulf country for all that. Two species—*A. pelago* and *A. blasio*—occur in special places throughout the whole southern half of Australia (mainland) with the exception of Central Australia as far as yet known. *A. ferrugineiventris* covers almost the same area, but reaches Queensland. *Phellus glaucus* and *P. piliferus* appear to have a similar distribution; the former has long been known to occur within a few miles of Sydney, but the fact has not been previously published; it also occurs near Brisbane.

I will take this opportunity to correct an error made in one of my papers concerning the genus *Phellus*. There are four species known to me; and at the time of referring to the genus I had allied the two "*piliferus*-like" species, which were only known from the male, with the two "*glaucus*-like" species, only known from the female. As the two species in each type differed essentially on the same character, I had concluded that these two types were the corresponding sexes of dimorphic species, but I have seen both sexes of each type since. My male *P. glaucus* is evidently *P. piliferus*, and perhaps this species is the unknown *Microstylum testaceum*, Macquart, which was described from a denuded specimen.

A further point in distribution is also worth mentioning: *Asilus blasio*, Walker, occurs around Perth on the sandy plains, where the evaporation is many times greater than the rainfall, but it also occurs on the Blue Mountains, where the reverse climatic conditions are to be expected. I have collected the species in both places.

Other and unexpected points in distribution and climatic conditions under which Asilids thrive are known to me; and I would favour the opinion that the distribution of Asilidæ is controlled by conditions of food rather than that of climate.

The authors fail in their paper by the lack of knowledge of the literature on their subject. They do not seem to

have consulted works later than 1915, and have not only overlooked White's important paper of 1918 (2), revising some of the genera, but also my still later ones (3). They have omitted several records of "Asilidæ known from Western Australia," to their list of which must be added :—

Asilus ferrugineiventris, Macquart. King George Sound, West Australia; New South Wales; Queensland.

Asilus inglorius, Macleay. West Australia; South Australia; Victoria; New South Wales; Queensland.

Blepharotes spp., Hardy, 1921. Two unnamed species, but sufficiently diagnosed for recognition. Perth, West Australia.

Opsoostlengis insignis, White. ♀. Perth, West Australia.

To the distribution of species previously published must be added :—

Asilus blasio, Walker. New South Wales.

Laphria telecles, Walker. Tasmania; Victoria.

Further, I would suggest that *Machimus forrestii* is *Neoitamus maculatus*, White, and the generic name is not applicable to any Australian species. *M. forrestii* must be placed on sufferance with other species under the *Neiotamus* complex if the synonymy is not established.

Blepharotes fulvus, Ricardo, to which my *B. brisbanensis* falls as a synonym, is possibly not correctly identified by the authors. Quite a number of species have been confused under the name.

The "styles" referred to under *Neosaropogon* and *Questopogon* are common to quite a number of genera, and are not even restricted to the Asilidæ; nevertheless, the suggestion that the character is of generic value is to be commended, and is valuable for future consideration.

In conclusion, I would like to point out that new names for species are not so much required at the present time as new facts concerning the characters of old species; and, as long as descriptions are based upon the inadequate system founded and followed respectively by Ricardo and White, there will be an accumulation of entanglements for future entomologists to puzzle over.

References.

(1) Ann. & Mag. Nat. Hist. (9) x. p. 517 (1922).
(2) Proc. Roy. Soc. Tasm. 1918, p. 72.
(3) Proc. Linn. Soc. N. S. Wales, xlv. pp. 185, 250 (1920); and xlvi. p. 285 (1921).

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XX.—*Exotic* Muscaridæ (*Diptera*).—X.* By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

Genus Atherigona, Rondani.

In this paper I present descriptions of some new and old species of this genus, and in a subsequent part I purpose giving a key to all the species which I have been able to identify or have described. The genus is of considerable economic importance in the tropics of the Old World, but the true status of the species composing it has not yet been established. It has been discovered that several feed upon various grasses in India and cause considerable damage; but, as that phase of the economy of the insects will be dealt with by others who are better able to deal with it than I am, I do not intend to dilate upon it in this paper. One species, *excisa*, Thomson, feeds in the larval stage in decaying fruits, and has the widest distribution of any in the genus, occurring throughout the eastern hemisphere and also in tropical and subtropical parts of the western hemisphere.

Some other species have been reported from a rather wide range in Africa and Asia, but in at least some cases this is due to an error in identification. There are many species in the genus, and some of them are remarkably similar in

* For Part IX., see Ann. & Mag. Nat. Hist. (9) xi., June 1923, pp. 664–675.

colour and habitus, so that such mistakes are liable to occur, unless great care is taken to compare specimens from different localities and also to dissect the males and expose the genital structures—a course not hitherto adopted by systematists in this genus.

Unfortunately, no author has given attention to the genitalia of the genus, nor in most cases to the exposed parts, which are of prime importance in the differentiation of these closely allied forms, and it is next to impossible to decide which species have been described, and which have not, from a perusal of the descriptions alone. I have tried to borrow the types of all Stein's species, but have failed to obtain more than a minority of them, though it may be possible to get the others later. In the meantime, I have decided to publish the data which I have obtained, to enable interested economic workers to give names to the species which they find in the field. The descriptions will be found to contain many details that are not present in those of other authors, but these are indispensable to correct identification, and their absence from the older descriptions has compelled me ot redescribe some of these species from the type-specimens, thus presenting for the first time English descriptions of these forms.

Atherigona setifemur, sp. n.

Male.—Testaceous yellow, centre of occiput above and abdomen shining, remainder of head and thorax yellow pollinose. Interfrontalia, antennæ, and arista dark brown or blackish, palpi paler. Thoracic dorsum with two narrow brown vittæ which extend on to disc of scutellum. Abdomen with the usual dark paired spots and central vitta very indistinctly limited, fused, so that each tergite is largely infuscated posteriorly. Legs yellow, apices of fore femora, fore and hind tibiæ, and all of tarsi blackened. Wings hyaline. Calyptræ and halteres whitish.

Head normal; arista tapered, subnude, second segment not elongated. Lower sterno-pleural bristle absent. Abdomen robust, basal part of hypopygium broader than in *excisa*, Thomson, not humped up. Fore femur not excised, without outstanding preapical postero-ventral bristles, fore tarsus about 1·5 as long as tibia, with rather short, fine, erect, curled hairs along sides, which are most distinct on basal segment; mid-tarsus with much longer hairs than fore pair; hind tarsi normal; hind femur with a short comb-like series of minute black bristles at base on postero-ventral surface.

First posterior cell distinctly narrowed apically; inner cross-vein a little before middle of discal cell; outer cross-vein slightly curved.

Female.—Similar to male, tarsi normal, inner cross-vein at middle of discal cell.

Length 4·5 mm.

Type, male, Aburi, Gold Coast, 30. xii. 1910 (*L. Armstrong*). Allotype, Uganda (*E. D. W. Greig*). Paratypes, five specimens, Akenge, Congo, x. 1913; one specimen, Medje, Congo, ix. 1910 (*Lang* and *Chapin*).

Atherigona pallidipes, sp. n.

Male.—Pale yellowish testaceous, dorsum of thorax and sometimes the pleura greyish, the former very faintly bivittate with brown. Abdomen with the usual paired spots and central vitta rather pale. Legs yellow. Wings hyaline.

Arista not longer than third antennal segment, almost bare, swollen on basal half, second segment not elongated. Lower sterno-pleural bristle present, but very small. Abdomen shorter and stouter than in last species, the basal segment of hypopygium as in *excisa*. Fore femur as in last species, tarsi normal. Inner cross-vein a little in front of middle of discal cell; first posterior cell narrowed apically.

Female.—Similar to male, the venation the same.

Length 4 mm.

Type, male, allotype, and two female paratypes, Coimbatore, South India, 28. viii. 1912, in cocoon of *Oryctes* (*T. V. Ramakrishna Ayyar*).

Atherigona distincta, sp. n.

Female.—Black, densely pale grey pruinescent, the abdomen more or less rufous or yellowish basally. Antennæ and palpi brownish yellow; interfrontalia brown, reddish anteriorly. Thoracic dorsum with two brownish vittæ, which are not sharply margined. Abdomen with a pair of large, irregularly shaped spots and a narrow elongate central spot on each tergite from first to fourth dark brown. Legs yellowish testaceous, fore femora and tibiæ (except their bases), apices of hind tibiæ, and all of tarsi blackish. Wings hyaline.

Orbital bristles short, incurved; face deeply concave, the antennæ when seen from the side with only half their width exposed; arista almost bare, slender except at base, second segment hardly longer than thick. Thorax sparsely haired;

sterno-pleura with two bristles and some black setulæ in centre, two or three of the latter quite prominent and curved backward and downward. Abdomen stout. Legs normal, fore femur as in preceding species; basal segment of fore tarsus about half as long as tibia. First posterior cell narrowed at apex; inner cross-vein close to middle of discal cell, sometimes slightly beyond middle.

Length 4·5–5 mm.

Type, and five female paratypes, Guindy, Saidpet, S. India, 1909 (*W. S. Patton*).

This and the two preceding species lack any outstanding bristles near apex of postero-ventral surface of fore femora. This character I at one time considered as sufficient to entitle these species to subgeneric rank, but the genitalia of the males are similar to that of *excisa*, which is the genotype of *Acritochæta*, and as that species has the outstanding postero-ventral bristles present in both sexes, I have deemed it wise to leave all the segregates in *Atherigona* until some better character for their distinction is discovered.

Atherigona tuberculata, sp. n.

Male.—Head yellow; occiput, except its lower margin, interfrontalia, frontal orbits in large part, antennæ, and palpi fuscous. Dorsum of thorax black, yellowish pruinescent, with three faint black vittæ; humeri yellow; pleura black in centre, with yellow pollen. Abdomen yellowish testaceous, with dense yellow pollen, three pairs of blackish spots, those on first visible tergite least distinct, and a faint central dark vitta on the same three tergites. Legs yellowish testaceous, apical half of fore femora, and of fore tibiæ, and all of tarsi black, apex of hind femur infuscated. Wings hyaline.

Head as in *excisa*; palpi short, normal, with armature as in *excisa*. Lower sterno-pleural bristle absent. Abdomen as in *excisa*, but the fifth sternite has a short finger-like process on each side at apex that projects backward, is densely setulose along the lower margin, and has a longer black bristle at apex. Fore femur without either outstanding postero-ventral preapical bristles or a dorsal excision; fore tarsus slightly longer than fore tibia, without exceptional armature; mid-legs normal; hind femur with a slight tubercle near base on postero-ventral surface, which is surmounted by about six short stout black bristles that are curved slightly towards base of femur; none of the tibiæ have the normal bristles, which is unique in the genus, as far

as I know. First posterior cell distinctly narrowed apically; inner cross-vein at about two-fifths from base of discal cell.

Length 4 mm.

Type, Yakuluku, Congo, 23. ix. 1911 (*Lang* and *Chapin*).

Atherigona aberrans, sp. n.

Male.—Darker in colour than the preceding species. Head blackish, with dense grey pruinescence; basal two segments of antennæ and base of arista yellow; palpi sometimes obscurely yellowish. Thorax blackish, densely grey pruinescent, without vittæ; humeri yellowish. Abdomen blackish, densely grey pruinescent, sometimes yellowish at base; first visible tergite with two large pale brown spots, second with two larger blackish spots, third with two very small spots, all three tergites with a median dark vitta partially present. Legs rather variable in colour, sometimes with tarsi fuscous and apices of fore tibiæ darkened, at times with most of fore femora and tibiæ and a large part of hind tibiæ blackened and all tarsi black. Wings hyaline.

Head as in preceding species; lower sterno-pleural bristle absent. Abdomen robust; fourth visible tergite in a ventral position, with a long yellowish bristle on each side which projects forward along venter almost to base of abdomen; third tergite (second visible) with a dense tuft of flexuous black bristles on each anterior lateral angle, the tergite usually overlapping venter so far that the tufts appear to be on venter. Fore femur without postero-ventral bristles or dorsal excavation; tarsi normal; hind femur with a fine long hair at base on postero-ventral surface; tibiæ with the median bristles minute. First posterior cell narrowed at apex; fifth vein not carried beyond apex of discal cell, the outer posterior angle of latter rounded; inner cross-vein at about two-fifths from apex of discal cell.

Female.—Similar to male. The abdomen has the spots more distinct, and these as well as the median vitta are present on four tergites; the thorax is rather noticeably bivittate with brown, and the posterior outer angle of discal cell is normal, the fifth vein being carried distinctly beyond that point.

Length 4–4·5 mm.

Type, male, allotype, and ten paratypes, Akenge, Congo, x. 1913; two paratypes, Poko, Congo, viii. 1913; three paratypes, Stanleyville, Congo, i.–iii. & viii. 1913; one paratype, Garamba, Congo, viii. 1913 (*Lang* and *Chapin*).

Atherigona longipalpis, sp. n.

Male.—Fulvous yellow, shining. Frons reddish brown, orbits paler, yellowish pruinescent, shining only at bases of bristles; face and palpi pale yellow; antennæ orange-yellow, tip of third segment above brownish, insertion of arista black; arista yellow on basal half, brown on tip half; upper half of occiput greyish. Thorax immaculate. Abdomen more or less blackened above apically, hypopygium brownish black, tergites yellowish pruinescent on sides, becoming greyish below. Legs yellow. Wings hyaline, veins brown.

Third antennal segment nearly as wide as frons; arista pubescent, distinctly longer than antennæ, basal pale half rather thick, apical dark half hair-like, second segment about as long as thick; palpi very long, at least as long as antennæ, dilated apically, furnished with soft hairs on apical third. Sterno-pleurals three. Abdomen short and ovate, second sternite very large, covering at least half of venter and overlapping sides of second tergite; hypopygium small, apparently similar to that of *excisa*. Fore femur as in *excisa*, but without any distinct postero-ventral bristle near apex; fore tarsus slender, as long as tibia, furnished with sparse outstanding hairs along antero-ventral and postero-ventral surfaces; mid and hind legs normal, rather slender. Inner cross-vein at middle of discal cell; veins 3 and 4 decidedly divergent apically, vein 3 ending behind wing-tip.

Length 4·5 mm.

Type, Island of Guam (*D. T. Fullaway*).

Atherigona maculipennis, Stein.

The largest and most conspicuously marked species of the genus known to me. It belongs to the same group as *excisa*.

Male.—Interfrontalia black; antennæ black, third segment very broad; arista with dense pubescence; palpi elongate, but only a little dilated apically, armed as in *excisa*. Thorax testaceous yellow, more greyish on dorsum and with three dark brown vittæ which do not extend over scutellum. Abdomen coloured as thorax, with a pair of spots on first visible tergite and a median vitta on tergites 2 and 3 pale brown, and a pair of black spots on tergites 2 and 4, largest and subtriangular on the second tergite; hypopygium yellow. Legs tawny yellow, fore femur excised above near apex and with about three preapical postero-ventral bristles; fore

tarsus with fine outstanding hairs on sides, longest and densest on anterior side ; mid-tarsus normal. First posterior cell very much narrowed at apex, where there is a distinct fuscous spot, the section of costa between apices of veins 3 and 4 about half as long as outer cross-vein ; inner cross-vein at middle of discal cell.

Female.—Differs from the male in having the femora almost entirely black, the fore and hind tibiæ black except at bases, and fore and hind tarsi black. The abdomen is darker and has a pair of irregularly shaped spots and median stripe on all tergites. Fore tarsi not fine-haired, the three postero-ventral bristles on fore femur are rather strong, first posterior cell less narrowed, the dark apical spot less distinct.

Length 5–6 mm.

Hab. Seychelles Islands. Redescribed from types.

Atherigona pallidipalpis, sp. n.

Male.—Closely resembles *excisa*. Differs in having the palpi pale yellow and yellow-haired, base of third antennal segment yellow ; humeri, pleura, and scutellum largely yellow ; legs paler, only apices of fore femora and bases of fore and mid tarsi brownish.

Structure of palpi as in *longipalpis* ; epistome rather noticeably produced. Fore femur as in *excisa*, but the only distinct postero-ventral bristle is very short and inconspicuous. Second visible tergite very large, meeting on venter, enclosing hypopygium, and covering lower half of sides of third tergite. In *excisa* the abdomen is similar, but the third tergite is usually visible to its lateral extremities. Wing as in *excisa*, but a little narrower.

Length 3·5 mm.

Type, Java, ix.–x. 1905 (*Jacobsen*).

Wrongly identified as *trilineata*, Stein, by Stein. That species is a synonym of *excisa*.

Atherigona crassiseta, Stein.

Male. — Antennæ black ; arista fuscous ; palpi black, the hairs apically whitish ; frons deep black ; orbits etc. pale grey pruinescent. Thorax with two narrow brown vittæ ; scutellum with a brown spot on each side at base. Abdomen rufous yellow, first visible tergite with a transverse spot on each side of median line on hind margin which taper laterally, next two tergites each with a rounded black spot

on each side posteriorly, their discs brownish with a grey pruinescent median vitta; hypopygium greyish pruinescent. Legs yellow, fore tarsi black, apices of fore tibiæ slightly darkened. Wings hyaline.

Arista with basal segment longer than thick, second segment about three times as long as thick, third thick on basal third, tapered apically, but not as slender as in normal forms, the dense pubescence causing it to appear slightly thickened; palpi dilated a little apically and with fine hairs at tips as in *excisa*, the bases on same side densely black-haired. Thorax normal. First and second tergites subequal in length, each four times as long as third, second meeting on venter. Fore tarsi slender, normal. First posterior cell slightly narrowed apically; inner cross-vein at middle of discal cell.

Length 4·5 mm.

Hab. Formosa. Redescribed from type.

Atherigona hendersoni, sp. n.

Male.—Head fuscous, face and cheeks yellowish; occiput and orbits greyish pruinescent; antennæ fuscous; palpi brown. Thorax testaceous yellow, black on dorsum and in centre of pleura, greyish pruinescent, dorsum with three faint vittæ; disc of scutellum black, the margin grey. Abdomen testaceous yellow, second, third, and fourth tergites each with a pair of fuscous spots near posterior margins; hairs and bristles on sides of tergites yellow. Legs tawny. Wings hyaline, with a slight fuscous clouding along apex.

Head and thorax as in *excisa*. Second visible tergite much prolonged laterally, meeting on venter, length on dorsum about three times that of third. Only one fore leg on type, the femur excised above, abraded below so that it is impossible to distinguish any outstanding postero-ventral bristles; no outstanding hairs on tarsi. First posterior cell distinctly narrowed at apex; inner cross-vein at three-sevenths from base of discal cell.

Female.—Darker in colour than male, and with dark cloud at apex of wing more distinct. Palpi fuscous; thoracic vittæ rather conspicuous, the median one continued over scutellum; abdomen with paired spots and a median vitta on all tergites, least distinct on first visible and smallest on fourth, the hairs and bristles inserted in dark dots; legs largely infuscated, usually the fore coxæ, apices of fore and mid femora, bases of fore and mid tibiæ, apical half of mid-

femora, and all of mid tibiæ and tarsi yellow. Fore femur with three or four short postero-ventral bristles.

Length 4–5 mm.

Type, male, allotype, and eight female paratypes, Henderson Island, South Pacific (*David R. Tate*).

Atherigona excisa, Thomson.

This species is the most widely distributed of the genus, occurring in the Hawaiian Islands, Formosa, China, India, Australia, many islands in the Pacific, Africa, and some tropical and subtropical parts of the New World, including Florida. The larvæ feed in decaying fruits such as banana, melon, tomato, etc., and the distribution of the species by commerce is therefore almost certain within the warmer parts of the world.

Grimshaw erected the genus *Acritochæta* for the species, redescribing it as new under the name *pulvinata*. The other synonyms known to me are as follows: *trilineata*, Stein (New Guinea); *magnipalpis*, Stein (Africa); *orientalis*, Schiner (Nicobar); *triseriata*, Walker (Molucca). I have examined the types of the Stein species, the others are given on Stein's authority.

The species is most closely allied to *hendersoni*, but differs from it in the lack of the dark cloud at apex of wing; the first posterior cell is very slightly narrowed at apex, only the third vein being a little incurved; the inner cross-vein is appreciably beyond middle of discal cell in both sexes; the fore femur in male is excised above and has one or two outstanding setulæ in both sexes; the tarsi of male are normal; the abdomen in male is short and stout, without outstanding structural characters, or chætotaxy; palpi slender, usually longer in female than male, fuscous or brown.

Length 3·5–4·5 mm.

British Museum material before me is from Ashanti, Africa; India, and Australia.

Atherigona destructor, sp. n.

Male.—Head yellow, upper occiput blackish, orbits, cheeks, and occiput densely yellowish-grey pruinescent; antennæ orange-yellow, arista brown, paler at base; palpi yellow; vibrissæ yellow. Thorax black, densely yellowish-grey pruinescent, with a narrow dark median vitta; humeri, tip of scutellum, anterior and lower median parts of pleura yellow. Abdomen testaceous yellow, greyish on dorsum in

middle, yellowish-grey pruinescent, second and third visible tergites each with a pair of small black spots, the former with a median black vitta; hypopygium orange-yellow. Legs yellow, tarsi hardly darker. Wings hyaline, veins brownish.

Head as in *varia*, Meigen; arista thickened on basal half, not very slender on apical half, subnude, second segment fully twice as long as thick; palpi short, dilated and with fine pale hairs at apices, two short black bristles at base on outer side. Thorax normal. First and second visible tergites subequal in length, third about three-fourths as long as second; hypopygial prominence stout, with a small, very slightly elevated, round process on each side at apex. Fore femur without concavity above, with one or two outstanding postero-ventral bristles; fore tarsus slender, longer than fore tibiæ, with some fine erect hairs along sides of basal two segments, those on antero-ventral surface of basal segment longest, at least three times as long as diameter of segment; other legs normal. First posterior cell hardly narrowed at apex; inner cross-vein at two-fifths from base of discal cell.

Female.—Differs from male in having the head darker, third antennal segment largely browned apically; scutellum not yellow at apex; apical half of fore femora and of fore tibiæ and all of fore tarsi black. Vibrissæ yellow as in male; abdomen with two pairs of spots.

Length 3 mm.

Type, male, allotype, two male and two female paratypes, Coimbatore, S. India, ii. 1922, reared from larvæ found mining in shoots of *Panicum miliaceum* (*V. Ramachandra Rao*). Paratypes, five males and four females, same locality, reared from larvæ mining in Panicum stems.

Material submitted by Government Entomologist at Coimbatore. Types deposited in the British Museum, and specimens in collection of writer and returned to sender.

Atherigona nudiseta, sp. n.

Male.—Head tawny, orbits, cheeks and occiput densely whitish-grey pruinescent; antennæ rufous yellow, greater part of third segment fuscous; arista fuscous, yellowish basally; interfrontalia yellow; palpi yellow. Thorax blackish, densely pale grey pruinescent, not distinctly vittate; humeri, anterior and lower central parts of pleura yellowish; scutellum grey. Abdomen yellowish testaceous, with slight pruinescence, shining, one pair of small black spots on second and another, smaller, on third visible tergite. Legs yellow. Wings hyaline, veins yellowish.

Head as in *varia*, Meigen; basal segment of arista about 1·5 as long as thick, second about three times as long as thick, third thickened on basal third, practically nude; palpi as in last species. Thorax normal. Abdomen as in last species; hypopygial prominence thick, widened at apex, the two projecting pieces when viewed from behind extending slightly above and below the median line, the upper extremities more widely separated than the lower and more broadly rounded. Fore legs as in *varia*, the tarsi slender, not abnormally haired, second and third segments slightly compressed in some specimens. First posterior cell distinctly, but not conspicuously narrowed at apex; inner cross-vein at two-fifths from base of discal cell.

Female.—Differs from male in having third antennal segment more extensively infuscated, basal two segments of arista shorter, apical half of fore femur and of fore tibia and all of fore tarsi black.

Length 4–4·5 mm.

Type, male, allotype, Coimbatore, S. India, xii. 1921, reared from larvæ boring in shoots of *Panicum stagninum* (*Y. Ramachandra Rao*). Paratypes, three females, Samalkote, S. India, two labelled "causing dead hearts in *Panicum stagninum*," xi. 1921, one labelled "boring in *P. stagninum*"; one male and two females, Coimbatore, labelled "bred from kudiraivali seedlings," 22. x. 1921 (*Y. Ramachandra Rao*). I understand this last plant is *Panicum frumentaceum* (teste *Y. R. Rao*).

Specimens from same source as last and deposited in same collections.

Atherigona bella, Frey.

A small species with habitus similar to that of *varia*. In colour the species are very similar, both having the fore tibiæ except bases and the fore tarsi black. The abdomen is yellow, with two pairs of dorsal spots in both, but the interfrontalia in *varia* is entirely yellow, while in *bella* it is blackened above. The hypopygial prominence is similar in both, consisting of a short stout stem, with a small process on each side at apex, and these are slightly curved upward; the prominence is rather larger in *varia* than in *bella*. Fore tarsi of neither dilated, and in *varia* there are no sparse erect hairs; but in *bella* there are erect black hairs along the sides on basal segment, which are most distinct on anterior side.

The only authentic female of *varia* that I have has the

interfrontalia entirely yellow and the fore femur almost entirely black, while in *bella* the interfrontalia is blackened above and the fore femur is black only on the apical half.

Length 3–3·5 mm.

Hab. Ceylon.

I have before me two males and four females taken in Ceylon by Col. J. W. Yerbury, 1890–92.

Pinned with a male and female there are two Chironomid midges, evidently the prey of this species. I know of no record of predacity in the genus, though Cœnosiinæ are well known as predators.

Atherigona bimaculata, Stein.

A very remarkable species in the male sex. Orbits glossy black, occiput glossy above except on orbits; antennæ and palpi black; arista with second segment about four times as long as thick, third segment with very short pubescence, which causes it to appear thickened to apex. Wing with a brown mark at humeral cross-vein and another in apex of subcostal cell. Dorsum of thorax shining black, sides and pleura yellowish. Abdomen similar to that of *læta*, Wiedemann, but the fourth visible tergite has on each side a long black bristle which is directed towards base of abdomen and adheres closely to venter; hypopygial prominence knob-like, as in *lævigata*, Loew. Fore legs normal, apices of fore femora and fore tibiæ blackened broadly, fore tarsi black, mid-pair slightly blackened basally, hind pair more distinctly so.

The female is similar to the male in colour, but the black on fore legs is more extensive and the hind tibiæ are brownish. The wings are unspotted.

Length 3·5–4 mm.

Hab. Seychelles Islands.

Redescribed from type and paratype material.

Atherigona læta, Wiedemann.

Very similar to *lævigata* in habitus and colour. The male has the occiput black and glossy on more than the upper half, the orbits are shining black on upper half; antennæ rufous on second segment and base of third; palpi pale yellow; second segment of arista about twice as long as thick. Abdomen testaceous yellow, the paired black spots on second and third visible tergites large and oblong, extending over the length of segments, those on fourth are small and round; hypopygial prominence with a small round

process on each side at apex. Fore tibiæ largely, fore tarsi entirely black, the latter distinctly compressed, about as thick at base as tibia at apex, without abnormal hairing. Venation as in *addita*, sp. n.

Female.—Similar to male, the orbits more glossy black; the spots on abdomen very large on all three tergites and the fore tarsi more compressed and broader. Fore femur yellow.

Length 4–5 mm.

This species was originally described from the East Indies. Stein has recorded it from Africa and several other regions, but most of his records are erroneous, though it will be impossible to state definitely which, unless his material is carefully examined. I have seen the species only from Formosa. Stein's African records apply to *lævigata*, Loew.

Atherigona lævigata, Loew.

This species closely resembles *læta* in general structure and colour. The glossy upper half of occiput, shining frontal orbits, thoracic and abdominal coloration are the same in both species, but *læta* has no spots on fourth tergite in male, and the apices of fore tibiæ are not deep black, but merely fuscous. In the male of *lævigata* the fore tarsi are not at all compressed, and in the female but slightly so. The hypopygial prominence in male *lævigata* is simple, knob-like, and there are a few outstanding hairs on the apical two or three segments of fore tarsi.

Length 3·5–4·5 mm.

I have seen this species only from Africa, having before me the type female and some specimens named *læta* by Stein. There are some African specimens in the British Museum material before me, from Mt. Chirinda, Mashonaland, and Southern Nigeria.

Atherigona addita, sp. n.

Male.—Head yellow, greyish or yellowish pruinescent, upper half of occiput and orbits blackish; interfrontalia deep black, turning to yellow anteriorly; face whitish yellow; antennæ fuscous, apex of second and base of third segments narrowly rufous; palpi whitish yellow. Thorax honey-yellow, with yellowish-grey pruinescence on dorsum, and golden-yellow pollen on pleura; dorsum with either three dark vittæ or the disc rather broadly infuscated; pleura unspotted; metanotum infuscated. Abdomen concolorous with thorax, glossy, with a pair of black spots on each

tergite from second to fourth visible. Legs honey-yellow, with a slight darkening on base of fore metatarsus. Wings hyaline.

Each orbit with about seven setulæ; antennæ large and broad; basal segment of arista fully twice as long as thick, second four times as long as thick, third rather thick and very gradually tapered on apical half, the pubescence short and dense; palpi short, dilated at apices, with a few short setulæ at bases on outer side, and with soft pale hairs at apices. Thorax normal, but the lateral, posterior, and scutellar bristles longer than usual. First visible tergite about one-fourth longer than second, second about one-fourth longer than third; hypopygial prominence divided into two rounded branches which are contiguous at bases, as long as thick, and divergent apically. Fore femur with one or two setulæ besides the usual bristle near apex; fore tarsus moderately elongate, basal segment with sparse fine erect hairs along sides. First posterior cell slightly narrowed at apex; inner cross-vein at two-fifths from base of discal cell.

Female.—Differs from male in having the antennæ narrower, second segment of arista twice as long as thick; palpi slender and with numerous short setulose hairs; abdomen usually with a pair of spots on tergites 2 to 4, and a central spot on each; fore femur sometimes black at apex, fore tibiæ and tarsi black.

Length 3·5–4·5 mm.

Type, male, allotype, one male and four female paratypes, Rodrigues Island, viii.–xi. 1918 (*H. J. Snell* and *H. P. Thomasset*).

Atherigona grisea, sp. n.

Male.—Head black, densely grey pruinescent, orbits not shining; interfrontalia rufous brown, paler in front; antennæ black, second segment brownish; palpi yellow. Thorax black, slightly shining, densely grey pruinescent, with three fine blackish vittæ anteriorly when seen from behind; humeri and propleura yellowish, remainder of pleura grey, sutures yellowish. Abdomen tawny yellow, dorsum of tergites 1 to 3 greyish pruinescent; second visible tergite with two large elongate black spots and a brownish median streak, third with similar but smaller markings; fourth tergite unspotted. Legs tawny yellow, apical half of fore femur except tip, fore tibia except base, and fore tarsus except apical segment black. Wings clear.

Second segment of arista barely twice as long as thick, pubescence of third segment very short; palpi short, apices dilated, some short black bristles near base on outer side, one or two minute black setulæ near apex, and the tips with soft pale hairs. Thorax normal. Abdomen with first two visible tergites subequal in length, third about two-thirds as long as second ; hypopygial prominence knob-like, prominent. Legs normal, fore tarsi slender, not as thick as tibiæ at apices, basal segment fully half as long as tibia, no outstanding hairs present. First posterior cell very slightly narrowed apically ; inner cross-vein about one-third from base of discal cell.

Female.—Similar to male. The palpi are longer and slender, with microscopic setulose hairs, the abdomen has tergites 2 to 4 maculated, the fore legs are more extensively blackened, and the hind tarsi are slightly brownish.

Length 2·5–3 mm.

Type, male, allotype, seven male and one female paratypes, Rodrigues Island, viii.–xi. 1918 (*H. J. Snell* and *H. P. Thomasset*).

Atherigona minor, sp. n.

Male.—Agrees in most characters with *grisea*, differing in having the palpi black, and the hypopygial prominence with two small points at apex.

Length 2·5 mm.

Type and one paratype, Rodrigues Is., viii.–xi. 1918 (*H. J. Snell* and *H. P. Thomasset*).

This may possibly be a variety of *grisea*, but none of the males of that species show any indications of varying from the type.

Atherigona tridentata, sp. n.

Male.—Black, densely grey pruinescent. Head black, upper parts of orbits slightly shining, centre of upper part of occiput shining, margins grey ; antennæ black ; palpi black, whitish at apices. Thorax slightly shining, with three faint dorsal vittæ. Abdomen with a central elongate black-brown linear spot and two lateral spots of same colour on each tergite from first visible to third inclusive, the spots large and wide on first, dilated at anterior and posterior extremities on second, and small and subtriangular on third, sides of third and fourth tergites and all of hypopygium orange-yellow, contrasting sharply with the grey black colour of rest of abdomen. Legs black, extreme apices of

femora and bases of tibiæ yellowish. Wings hyaline. Calyptræ and halteres white.

Head normal; second aristal segment about three times as long as thick, third swollen on basal third nearly bare; palpi short, dilated at apices. Thorax normal. Abdomen as in *læta*, the hypopygial prominence tridentate. Legs slender, normal. Wing as in *læta*.

Length 3 5 mm.

Type, Nakuru, Kenya Colony, i. 1913 (*B. L. van Someren*).

This is the species recorded by Stein from Africa as *nigripes*, Stein. I have now before me the female type of the latter, which was taken in New Guinea, and it is quite distinct from *tridentata*. Stein departed from his usual rule in mentioning the form of the hypopygial prominence in his description of *nigripes*, which enables me to make certain of the distinction between the two species in the male sex. He describes it as having two branches, which are divergent, quite different from the stout process of *tridentata* with its three minute teeth.

Atherigona nigripes, Stein.

Female.—Black, densely grey pruinescent. Orbits and occiput entirely grey pruinescent; antennæ and palpi black. Thorax with three dark brown vittæ, the median least distinct, none of them continued over scutellum. Abdomen with basal tergite yellowish near base, all tergites with a pair of large oblong black spots, those on second and third curved on their inner margins, the median vitta linear and faint. Legs black, trochanters yellowish. Wings clear, inner cross-vein at middle of discal cell; first posterior cell very slightly narrowed at apex; outer cross-vein at less than its own length from apex to fifth vein. Fore femur with at least two outstanding bristles near apex on postero-ventral surface; fore tarsus not compressed; one fore tibia with a median posterior setulæ (abnormal?).

Length 5 mm.

Hab. New Guinea. Redescribed from type-specimen.

Atherigona flexinervis, Stein.

This species is readily separated from its allies by the peculiar venation of the wings. In both sexes the outer cross-vein has its posterior extremity at about one-half of its own length from apex of fifth vein and its anterior extremity at about its own length from inner cross-vein, the vein is

curved, and a line drawn through its extremities would strike the costa at apex of first vein ; last section of fourth vein three times as long as preceding section. Fore femur in male with two preapical bristles ; fore tarsus with fine outstanding hairs along sides basally ; hypopygial prominence stout, with two rather widely separated processes which are higher than wide and slightly produced upwards at their upper extremities. Palpi black ; second segment of antennæ rufous, third black ; arista normal ; orbits and occiput not glossy ; interfrontalia rufous brown. Thorax and abdomen black, densely grey pruinescent, the former with humeri, pleura, and apex of scutellum yellowish. Abdomen yellowish at base and on apices of tergites, the paired dark spots largest on first visible tergite, absent on fourth. Fore tarsi of female normal, abdomen with a central vitta and four pairs of oblong black spots.

Length 4–4·5 mm.

Hab. New Guinea. Redescribed from types.

Atherigona indica, sp. n.

Male.—Head grey, densely pale grey pruinescent. Cheeks and lower part of occiput yellowish ; interfrontalia rufous brown ; antennæ black, second segment rufous ; arista yellow, darker apically ; palpi black, yellow at apices. Thorax fuscous, densely pale grey pruinescent, humeri and propleura yellowish, dorsum not vittate. Abdomen testaceous yellow, dorsum with greyish pruinescence, second visible tergite with a rather large pair of subtriangular black spots and a very faint brownish median stripe, third with a much smaller pair of black spots. Legs yellow, bases of fore tarsi and usually also apices of fore tibiæ slightly infuscated. Wings clear, usually with a yellowish tinge at apex of auxiliary vein.

Head as in *læta* ; arista with very slight pubescence, second segment about twice as long as thick, third swollen on basal third ; palpi short, dilated at apices and with three black setulæ at bases. Thorax normal. Abdomen similar to that of *læta* ; hypopygial prominence short and wide, with two widely separated processes that are about as long as thick and slightly knobbed or swollen at apices. Fore legs slender, femora with one bristle, tarsi normal. First posterior cell slightly narrowed ; inner cross-vein a little before middle of discal cell.

Female.—Differs from male in having the palpi longer and slender, more blackened, and with short setulæ ; abdomen

with three pairs of black subtriangular spots ; fore femur on apical half, fore tibia except base and all of fore tarsi black, mid and hind tarsi fuscous.

Length 3·5–4·5 mm.

Type, male, allotype, three male and six female paratypes, Coimbatore, S. India, viii.–ix. 1915, reared from cholam (*Andropogon sorghum*). Paratypes, 16 specimens from same locality, i.–ii. 1914, reared from cholam stubble (*Y. Ramachandra Rao.*).

XXI.—*New or little-known* Tipulidæ (*Diptera*). — XVI. *Australasian Species.* By Charles P. Alexander, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

The present paper is based upon New Zealand species, collected by my friends Messrs. Campbell, Harris, Lindsay, Tapley, and Watt. The types are preserved in the writer's collection through the kindness and generosity of the collectors.

Dicranomyia canterburiana, sp. n.

Belongs to the *huttoni* group; rostrum ochreous-yellow ; antennal segments with short basal pedicels; mesonotal præscutum with three brown stripes; pleura heavily grey-pruinose ; wings tinged with grey, the stigma and seams along the cord and outer end of cell 1*st* M_2 pale brown ; a supernumerary cross-vein in cell *Sc* ; male hypopygium with the ventral dististyle large and fleshy.

Male.—Length 7–7·2 mm. ; wing 8·3–8·7 mm.

Rostrum a little shorter than the head, ochreous-yellow ; palpi black. Antennæ black, the base of the first scapal segment paler; flagellar segments black, the face of each produced into a moderately long serration, the shiny basal pedicel short. Head grey.

Mesonotal præscutum brownish ochreous, with three brown stripes that become obscured to obliterated shortly before the suture; scutum similar, the lobes slightly darkened ; scutellum and postnotum pale, sparsely pruinose. Pleura for the most part dark-coloured, heavily grey-pruinose : dorsal region of sterno-pleura a little paler ; anterior region of postnotal pleurotergite paler. Halteres pale, the knobs large. Legs with the coxæ obscure brownish

yellow, the outer face of the fore coxa darkened; trochanters obscure brownish yellow; femora brownish yellow, the tips faintly darkened; tibiæ and tarsi light brown, the terminal tarsal segments passing into dark brown. Wings tinged with grey; stigma pale brown; moderately broad, pale brown seams along the cord, outer end of cell 1*st* M_2, along vein *Cu*, and around the apical margin of the wing; a brown cloud at origin of *Rs*; veins brown. Venation: Sc_1 ending opposite the origin of *Rs*; a supernumerary cross-vein beyond mid-length of cell *Sc*; *Rs* about twice the basal deflection of R_{1+5}; *r* long, arcuated; cell 1*st* M_2 large, approximately as long as vein M_{1+2} beyond it; basal deflection of Cu_1 at the fork of *M*.

Abdomen dark brown, the genitalia brownish yellow. Male hypopygium with the mesal apical face of each basistyle produced into a densely setiferous cushion; immediately cephalad of this a small setiferous lobule. Ventral dististyle large and fleshy, the rostrum short with two small subequal black spines that are directed strongly basad. Ninth tergite with a small setiferous tubercle on either side of the median line, the space between them broadly U-shaped.

Hab. New Zealand (South Island).

Holotype, ♂, Governor's Bay, Banks Peninsula, Canterbury, November 25, 1922 (*J. F. Tapley*).

Paratopotypes, 2 ♂ ♂, November 16, 1922 (*J. F. Tapley*).

The male hypopygium is of a different structure from the other members of the *huttoni* group, but the details of the antennæ require that the species be placed in this group of flies.

Dicranomyia harrisi, sp. n.

Belongs to the *huttoni* group; mesonotal præscutum with a single broad brown stripe; pleura yellow with a more or less distinct brown spot on the mesepisternum; femora with a dark brown subterminal ring; wings tinged with yellow; stigma oval, dark brown; veins with long macrotrichiæ; abdominal tergites dark brown, the caudal margins of the segments conspicuously obscure yellow.

Male.—Length, including rostrum, about 6·5 mm.; wing 7·3–7·5 mm.

Rostrum nearly twice the length of the head, dark brown, including the palpi. Antennæ with the scape obscure brownish yellow; flagellum dark brown, the segments with relatively long pubescent serrations and slender glabrous apical pedicels. Head light grey; vertex between the eyes narrow.

Pronotum dark brown. Mesonotal præscutum shiny brownish yellow with a conspicuous median brown stripe; scutal lobes, scutellum, and mediotergite of postnotum dark brown, with a continuous yellow median stripe traversing all three sclerites. Pleura yellow with a more or less distinct brown spot on the mesepisternum. Halteres rather short, obscure yellow, the knobs dark brown. Legs with the coxæ and trochanters yellow; femora yellow with a conspicuous, dark brown, subterminal annulus; tibiæ brownish yellow, the tips narrowly dark brown; tarsal segments brown with the tips of the segments blackened. Wings tinged with yellow, the base and costal region a little brighter; stigma oval, dark brown; very narrow brown seams along the cord and outer end of the cell 1*st* M_2; wing-veins with long conspicuous macrotrichiæ. Venation: Sc_1 ending about opposite one-third to one-fourth the length of *Rs*, Sc_2 immediately beyond this origin; inner ends of cells R_3 and 1*st* M_2 lying more basad than cell R_3; basal deflection of Cu_1 at or close to the fork of *M*.

Abdominal tergites dark brown, the caudal margins of the segments conspicuously obscure yellow; basal sternites clear yellow, the terminal segments infuscated; hypopygium obscure reddish brown. Male hypopygium with the tergite semicircular in outline, with a small U-shaped median notch, the lateral lobes blackened and sparsely setiferous. Basistyles with large hairy lobes on mesal face. Ventral dististyle relatively small, the chitinized rostrum bearing two separated spines, the more distal one being about two-thirds the length of the basal spine; dorsal dististyle only slightly curved, blackened. Ædeagus bifid at apex.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune to mountain-hut on Ruapehu, altitude 3000–4000 feet, January 12, 1923 (*T. R. Harris*).

Paratopotypes, 2 ♂♂; *paratype*, ♂, Ohakune, altitude 2060 feet, December 31, 1922 (*T. R. Harris*).

This interesting crane-fly is named in honour of the collector, my friend Mr. T. R. Harris.

Dicranomyia luteipes, sp. n.

Male.—Length 6–6·5 mm.; wing 7·5–8·5 mm.

Female.—Length 6·5 mm.; wing 8·5 mm.

Related to *D. vicarians* (Schiner), differing as follows:—

Basal flagellar segments paler. Mesonotal præscutum shiny obscure yellow with a narrow, median, dark brown stripe which crosses the suture and suffuses the scutal lobes;

mediotergite of the postnotum with the median area darkened. Pleura and sternum greenish yellow, unmarked with darker. Halteres pale throughout. Legs uniformly yellow, the tarsal segments passing into brown. Wings with a yellow tinge, the base and costal region clearer; stigma brown; very narrow brown seams along cord and outer end of cell *1st* M_2; a tiny brown cloud at origin of *Rs*. No dark seams on Sc_2 and no dark clouding along veins *Cu* and *2nd A*. Venation: Sc_1 shorter; *Rs* less strongly arcuated. Abdominal tergites dark brown with about the basal half of each of segments 3 to 8 obscure yellow; sternites uniformly yellow. Ventral lobes of male hypopygium large and fleshy.

Hab. New Zealand (both Islands).

Holotype, ♂, Mt. Grey, Canterbury, altitude 1200–1500 feet, November 27, 1921 (*J. W. Campbell and S. Lindsay*).

Allotype, ♀, Ohakune, Wellington, altitude 2060 feet, November 18, 1921 (*T. R. Harris*).

Paratypes, 1 ♂, with the allotype; 1 ♂, Ohakune, December 10, 1922 (*T. R. Harris*).

The type was swept from undergrowth in a beech forest. One of the paratypes was found hanging around a waterfall, associated with the types of *Dicranomyia torrens*, Alexander.

Dicranomyia diversispina, sp. n.

Belongs to the *monilicornis* group; general coloration light ochreous-yellow; antennæ black, the basal segment light yellow; wings hyaline, stigma lacking; cell *2nd A* narrow; male hypopygium with the rostrum of ventral dististyle bearing two curved spines of different shapes and sizes.

Male.—Length 5 mm.; wing 6 mm.

Rostrum only a little shorter than the head, ochreous: palpi dark brown, the basal segment paler. Antennæ black, the basal segment of the scape abruptly light yellow: flagellar segments oval. Head light brownish yellow.

Pronotum, mesonotum, and pleura uniformly shiny ochreous-yellow, unmarked with darker. Halteres elongate, pale, the knobs dark brown. Legs long and slender, the coxæ and trochanters concolorous with the pleura; femora brownish yellow; tibiæ brown; terminal tarsal segments passing into darker brown. Wings hyaline; stigma lacking; veins pale brown. Venation: *Sc* short, Sc_1 ending a distance before the origin of *Rs* that is longer than the basal deflection of Cu_1; Sc_1 alone about equal to this same

distance; *Rs* strongly angulated at mid-length; cell *1st* M_2 relatively small, the basal deflection of Cu_1 at its base; cell *2nd A* long and narrow.

Abdominal tergites dark brown, the lateral margins yellowish; sternites yellow. Male hypopygium with the rostrum of the ventral dististyle short, bispinous, the outer spine long and slender, curved gently basad, arising from a conspicuous papilla; the second spine is at the base of the rostrum, about one-half the length of the first, but very stout and curved strongly basad, the apex acute; cephalic margin of rostrum with a fringe of about six strong setæ.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, October 31, 1922 (*T. R. Harris*).

Molophilus latipennis, sp. n.

Antennæ short; general coloration of mesonotum reddish brown; thoracic pleura dark brown; femora and tibiæ yellow; wings very broad, yellow, the base of cell *R* and a seam along the cord brown.

Male.—Length 4·8–5 mm.; wing 6 mm.

Female.—Length 5–5·4 mm.; wing 5·6–6·3 mm.

Rostrum and palpi brownish black. Antennæ short in both sexes, the scape reddish brown; flagellar segments brown with a dense white pubescence. In the female, the antennæ are almost entirely pale yellow. Head dark grey.

Pronotum dark brown. Mesonotal præscutum reddish brown, the median area a little darker anteriorly, the lateral margins of the sclerite behind the pseudosutural foveæ narrowly dark brown; remainder of mesonotum reddish brown. Pleura shiny dark brown, the sterno-pleura obscure brownish yellow. Halteres dark brown, the base of the stem whitish, the knobs obscure reddish brown. Legs with the coxæ obscure yellow; remainder of the legs yellow, the terminal tarsal segments dark brown. Wings very broad, strongly tinged with yellow; a conspicuous brown cloud along the cord, continued on the basal deflection of Cu_1; basal two-thirds of cell *R* infuscated; macrotrichiæ dark brown, the costal fringe black; veins yellowish, brown in the darkened areas. Venation: cell R_3 narrowly sessile; vein *2nd A* long, ending just before the base of cell M_3.

Abdomen light brown, the lateral margins of the tergites broadly dark brown; sternites yellowish testaceous, the caudal margins of the segments darkened; hypopygium obscure yellowish brown. Male hypopygium with the apex

of the basistyle blackened, terminating in a small black tubercle, the mesal face setiferous. Outer dististyle bifid, the largest arm a black flattened blade whose rounded apex is microscopically serrate; basal dististyle a chitinized rod, shaped somewhat like a ten-pin, the basal region expanded, the neck slender with the apex truncate or feebly toothed. Gonapophyses appearing as oblong setiferous cushions.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune to mountain-hut on Ruapehu, altitude 3000–4500 feet, January 12, 1923 (*T. R. Harris*).

Allotype, ♀, January 1921 (*M. N. Watt*).

Paratopotypes, 2 ♂♂, with the type; 1 ♀, with the allotype.

Molophilus latipennis is the largest species of the genus so far discovered in New Zealand. The female specimens were taken along the trail to the mountain-hut in the zone of silver beech (*Nothofagus Menziesii*, Hooker f.), associated with other Tipulidæ such as *Discobola tesselata*, Osten-Sacken, *Ceratocheilus ochraceus*, Edwards, *Limnophila ruapehuensis*, Alexander, *L. watti*, Alexander, *Cerozodia hudsoni hemiptera*, Alexander, *Macromastix ferruginosa ruapehuensis*, Alexander, and other subalpine species.

Molophilus uniplagiatus, sp. n.

Related to *M. latipennis*, sp. n.; mesonotal præscutum dark brown with three conspicuous ochreous-yellow stripes, the median stripe split by a capillary dark brown line; pleura dark brown, indistinctly striped longitudinally with paler; wings dark brown, with a conspicuous light yellow blotch near the centre of the wing.

Male.—Length about 3·6 mm.; wing 4·5–4·6 mm.

Female.—Length about 3·5 mm.; wing 4·3 mm.

Rostrum and palpi black. Antennæ short; scape brown, the flagellum pale brown to brown, with a dense white pubescence. Head dark brown.

Pronotum dark brown. Mesonotal præscutum dark brown, with three conspicuous ochreous-yellow stripes, the median stripe bisected by a capillary dark brown line that is broadest in front, gradually narrowed to a point at the suture; extreme lateral margin of the præscutum behind the pseudosutural foveæ ochreous; scutum with the lobes ochreous-yellow, the median area dark brown; scutellum dark brown; mediotergite of postnotum infuscated on cephalic half, the posterior half largely ochreous. Pleura shiny dark brown with a more or less distinct longitudinal

pale line across the ventral pleurites to the base of the halteres; dorso-pleural membrane paler; sterno-pleura ochreous. Halteres dark brown, the base of the stem pale. Legs with the coxæ dark brown; trochanters obscure yellow; remainder of the legs pale, clothed with dark brown and a few paler setæ. Wings tinged with brown, the base, costal and stigmal regions yellowish, but more or less obscured by the macrotrichiæ; a conspicuous blotch near the middle of the wing before the cord light yellow; veins brown; macrotrichiæ dark brown. Venation: vein *2nd A* long, ending before mid-length of the petiole of cell M_3.

Abdominal tergites dark brown, the bases of the segments paler; sternites yellow; hypopygium dark. In the females, the tergites are more uniformly darkened. Male hypopygium complex in structure. Basistyles produced caudad into stout lobes, the mesal faces of which are provided with numerous black setiferous tubercles. Outer dististyle with an outer chitinized blade as in *M. latipennis*, the margin microscopically serrate; two basal styles, one very slender, beyond the base appearing as an acute spine; the other style is a flattened blade, the apex curved and acutely pointed.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune to mountain-hut on Ruapehu, altitude 3000–4500 feet, January 12, 1923 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, 5 ♂ ♀, January 12–15, 1923; *paratypes*, 1 ♂, 1 ♀, Ohakune, altitude 2060 feet, December 31, 1922 (*T. R. Harris*).

Molophilus secundus, sp. n.

Male.—Length about 3·5 mm.; wing 4·3 mm.

Very closely related to *M. multispinosus*, Alexander (South Island), from which it differs as follows:—

Wings greyish subhyaline (instead of light yellow), the veins slightly darker grey; macrotrichiæ dark brown. Abdomen and hypopygium paler than in *multispinosus*. Male hypopygium with the enlarged base of the inner dististyle projecting beyond the level of the base of the chitinized apex; the latter is a powerful, strongly chitinized rod terminating in a long apical point, before this apex a group of long spines on the inner face. Outer dististyle similar to *multispinosus*, but the apical ear-shaped lobe with a small lateral tooth at the base.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, December 13, 1922 (*T. R. Harris*).

Molophilus oppositus, sp. n.

Related to *M. sepositus*, Alexander; general coloration dark brown, the mesonotal præscutum more yellowish brown; halteres brownish black, the base of the stem pale; male hypopygium with the outer dististyle bidentate at apex; gonapophyses very long, curved spines.

Male.—Length 3·6–3·7 mm.; wing 3·9–4 mm.

Rostrum and palpi brownish black. Antennæ moderately long, if bent backward extending to just beyond the wing-root, brown to dark brownish black. Head dark.

Pronotum dark brown. Mesonotal præscutum shiny yellowish brown, the anterior and lateral margins and the interspaces darker brown, the latter with conspicuous, erect, black setæ; remainder of the mesonotum dark brown, the scutal lobes paler laterally. Pleura brownish black. Halteres brownish black, the base of the stem pale. Legs with the coxæ concolorous with the pleura, the posterior coxæ more testaceous; trochanters brownish testaceous; femora and tibiæ pale brown, clothed with black trichiæ; tarsi dark brown. Wings tinged with brown; veins darker; macrotrichiæ dark brown. Venation: *r* just beyond the level of *r–m*; vein *2nd A* moderately long, ending just beyond the fork of *M*.

Abdomen brownish black, including the hypopygium. Male hypopygium with each basistyle stout basally, produced caudad into a slender, unarmed, digitiform lobe that extends beyond the level of the other elements of the hypopygium, the lateral faces densely hairy. Dististyles arising from the mesal face of the basal enlargement of the basistyle; outer dististyle a straight rod, gradually enlarged to the apex, this blackened and terminating in two acute black spines that lie opposite one another, the mesal one directed mesad, the lateral one directed caudad; inner dististyle subequal in length, a brown rod, very nearly straight, gently narrowed to the blunt apex. Gonapophyses very conspicuous, longer than the dististyles, each a very long, slender, curved spine, the acute tips more or less decussate across the genital chamber in prepared slides, but in a normal position directed ventrad.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune to the mountain-hut on Ruapehu, altitude 3000–4500 feet, January 12, 1923 (*T. R. Harris*).

Paratopotypes, 2 ♂ ♂.

Molophilus bidens, sp. n.

Belongs to the *terminans* group; general coloration dark brown; halteres pale, the knobs silken-yellow; wings tinged with brown; male hypopygium with the outer dististyle terminating in an acute spine, before the apex of which is a bidentate blade.

Male.—Length about 3·8–4 mm.; wing 5–5·3 mm.

Rostrum and palpi dark brownish black. Antennæ short; scapal segments pale brown, the flagellar segments dark brown with elongate verticils. Head black, grey-pruinose.

Pronotum and mesonotum dark brown, the posterior portion of the postnotal scutellum and lateral margins of the præscutum dull yellow. Pleura shiny dark brown. Halteres pale, the knobs silken-yellow. Legs with the fore coxæ dark brown; the other coxæ and the trochanters obscure yellowish testaceous; femora brown, the bases paler; tibiæ and tarsi dark brown. Wings tinged with brown; veins pale brown; macrotrichiæ dark brown, evenly distributed. Venation: vein *2nd A* long, ending opposite or beyond mid-length of the relatively short petiole of cell M_3.

Abdomen dark brown, including the hypopygium. Male hypopygium of the type of *M. terminans*, Alexander. Outer dististyle very complex in structure, a heavily chitinized, curved arm terminating in a straight, acute, black spine; before this apex bearing laterally a flattened blade that terminates in two acute points, one spine shorter, more slender, and heavily chitinized, the entire blade roughly suggesting a seed of the genus *Bidens*; inner dististyle cylindrical, strongly curved at mid-length, the base and apex straight, the tip produced into an acute straight spine, the base of which is surrounded by numerous microscopic setæ; surface of this style with 10–12 microscopic spinulæ.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, December 10, 1922 (*T. R. Harris*).

Paratopotype, ♂; *paratype*, ♂, Ohakune to mountain-hut on Ruapehu, altitude 3000–4500 feet, January 12, 1923 (*T. R. Harris*).

Molophilus tenuissimus, sp. n.

Belongs to the *terminans* group; general coloration dark brown; halteres pale; wings strongly tinged with brown; male hypopygium with the outer dististyle elongate, ribbon-like, tapering to the acute tip.

Male.—Length about 3·6 mm.; wing 4·3 mm.

Rostrum and palpi dark brown. Antennæ short, black throughout. Head black, sparsely pruinose.

Pronotum and mesonotum dark brown, the extreme lateral margin of the præscutum paler. Pleura dark brown. Halteres pale, the knobs yellowish white. Legs with the coxæ brown, paler apically; trochanters brownish yellow; remainder of legs dark brown; the femoral bases paler. Wings strongly tinged with brown; veins darker brown; macrotrichiæ brownish black. Venation: basal section of R_{2+3} twice the basal deflection of R_{1+5}; vein *2nd A* ending about opposite mid-length of the petiole of cell M_3.

Abdomen dark brownish black, including the hypopygium. Male hypopygium of the type of *M. terminans*, Alexander, and most similar among the described species to *M. tenuistylus*, Alexander. Longest dististyle a long, curved, ribbon-like blade that tapers gradually to the acute apex, the margins unarmed; inner dististyle about one-half the length of the outer, broad-based, the apical three-fifths a curved horn that tapers gradually to the acute apex, this portion set with about nine conical spinulæ similar to those found in *M. tenuistylus*.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, December 13, 1922 (*T. R. Harris*).

Gnophomyia alpina fumipennis, subsp. n.

Male.—Length about 3·5 mm.; wing 4·4 mm.

Differs from the typical form in the following regards:—

Legs dark brownish black. Wings with a very strong brown suffusion that is almost as intense as the stigmal area itself; veins about as dark as in the typical form, but not contrasting strongly against the dark background. Venation: Sc_2 about twice its length from the tip of Sc_1.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, December 13, 1922 (*T. R. Harris*).

Gnophomyia alpina fulvipleura, subsp. n.

Female.—Length about 4 mm.; wing 4·6 mm.

Differs from the typical form in the following regards:—

Mesonotal præscutum reddish brown, the lateral margins fulvous, the surface subshiny as in the typical form; scutellum, postnotum, and pleura obscure fulvous. Legs darker than in the typical form, brownish black. Wings

tinged with grey or pale brown, the stigma oval, slightly darker brown.

Hab. New Zealand (North Island).

Holotype, ♀, Ohakune, altitude 2060 feet, December 1, 1922 (*T. R. Harris*).

Paratopotype, ♀.

Elephantomyia (*Elephantomyodes*) *ruapehuensis*, sp. n.

Mesonotal præscutum with three brownish-black stripes, the lateral margins of the sclerite broadly golden-yellow; pleura dark grey; wings tinged with yellow; cord and outer end of cell 1*st* M_2 seamed with brown; cell 1*st* M_2 large, rectangular; abdominal tergites dark brown, the bases of the segments broadly obscure yellow.

Female.—Length, excluding rostrum, 7·5 mm.; wing 8·3 mm.; rostrum about 4·4 mm.

Rostrum a little more than one-half the length of the body, black, the palpi concolorous. Antennæ with the scape light yellow; flagellum black, apparently only 11-segmented, with all except the basal two or three segments with conspicuous elongate verticils. Head dark brown, the orbital region and anterior part of the vertex and front light grey.

Pronotum grey. Mesonotum golden-yellow, the disk largely covered by three nearly confluent brownish-black stripes, the humeral region and broad lateral margins remaining of the ground-colour; scutal lobes and scutellum brownish black, the centres yellowish-grey pruinose; mediotergite of postnotum black, grey-pruinose medially. Pleura dark grey, especially the sterno-pleura; dorsal pleurites and pleuro-tergite lighter grey. Halteres yellow, the knobs dark brown. Legs with the coxæ brown, sparsely pruinose, the tips passing into yellow; trochanters yellow; femora brown, the bases pale, the tips narrowly dark brown; tibiæ brown, the tips darker brown; tarsi black; all segments of the legs, except the three terminal tarsal segments, with scattered, erect, bristles; tibial spurs lacking. Wings tinged with yellow; stigma elongate-oval, dark brown; wing-apex broadly infuscated; conspicuous brown seams along cord and outer end of cell 1*st* M_2; a small brown spot at origin of Rs; a faint brown seam along vein Cu; veins dark. Venation: Sc_2 at tip of Sc_1; Rs elongate, angulated and spurred at origin; basal deflection of R_{4+5} only a little longer than r–m; cell 1*st* M_2 large, rectangular; m less than one-half the outer deflection of M_3; basal deflection of Cu_1 from

two-fifths to one-half the length of cell *1st* M_2; vein *2nd A* short, the cell being correspondingly short but narrow.

Abdominal tergites dark brown, the basal quarter of each segment obscure yellow, the extreme caudal margin of each narrowly of the same colour; sternites obscure yellow, infuscated medially, this more distinct on the subterminal segments. Ovipositor long and slender, horn-coloured.

Hab. New Zealand (North Island).

Holotype, ♀, Mountain Track, Ohakune to mountain-hut on Ruapehu, altitude 3000–4500 feet, January 15, 1923 (*T. R. Harris*).

Gynoplistia bilobata, sp. n.

Male.—Length about 14 mm.; wing 13–13·5 mm.

Female.—Length about 17 mm.; wing 14 mm.

Closely allied to *G. subfasciata*, Walker, from which it differs as follows:—

Mesonotal præscutum with a capillary dark brown median vitta. Halteres yellow, with only the knobs dark brown. Wings with the tips distinctly darkened in both sexes, this infuscation including the apex beyond the fork of M_{1+2}. The chief distinctions are found in the structure of the male hypopygium, which shows the long pointed median lobe of the ninth tergite found in *subfasciata*. The blackened lobe on the mesal face of the basistyle is truncated apically (rounded in *subfasciata*), and at its base bears a smaller but similar lobe, which in *subfasciata* is represented only by a small lobule. Outer dististyle with the spinulose apex broader, more depressed, projecting far beyond the apex of the small, subapical, smooth spine. In *subfasciata* these spines are subequal in length. Inner dististyle with the slender distal portion neither so strongly curved nor clavate in appearance.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, December 1, 1922 (*T. R. Harris*).

Allotopotype, ♀, in copulâ; pinned with type.

Paratopotypes, 3 ♂♂, November 16–25, 1921 (*T. R. Harris*).

Gynoplistia pallidistigma, sp. n.

General coloration grey, the præscutum with three brown stripes; antennæ with 17 segments, the branches moderately long; femora dark brown with a barely distinct subterminal ring; wings tinged with yellow, the stigma pale; abdomen grey, the subterminal tergites ringed

caudally with pale; male hypopygium with the ninth sternite and mesal margins of basistyles with setiferous lobes; outer dististyle very strongly expanded at apex.

Male.—Length 10·5–11 mm.; wing 11·2–11·4 mm.

Female.—Length 15 mm.; wing 9·5 mm.

Rostrum and palpi brownish black. Antennæ 17-segmented in both sexes, the formula in the ♂ being 2+2+8+5; first scapal segment brown, dusted with grey, the second scapal and flagellar segments entirely black, including the branches; flagellar branches moderately elongate, the longest not quite three times the length of the segment that bears it. In the ♀ the basal six flagellar segments are short-pectinate. Head light grey.

Pronotum grey. Mesonotal præscutum grey with three narrow but conspicuous brown stripes, the median stripe broader in front, strongly narrowed behind, extending to the suture; humeral angles darkened; remainder of mesonotum grey, the scutal lobes darkened. Pleura light grey. Halteres obscure yellow, the knobs dark brown. Legs with the coxæ reddish, light grey pruinose to appear salmon-coloured; coxæ fulvous-yellow; femora dark brown, the bases broadly brownish yellow; a very indistinct reddish subterminal ring; tibiæ brownish yellow, the tips conspicuously blackened; tarsal segments 1 and 2 light brown, the tips blackened; remainder of tarsi black. In the ♀ the reddish femoral rings are entirely lacking. Wings tinged with yellow, the costal region and wing-base brighter yellow; stigma yellow, the apex (a narrow seam at *r*) dark brown; wing-markings almost obsolete, consisting of tiny clouds at origin of *Rs*; along cord and outer end of cell 1*st* M_2; fork of M_{1+2} and the wing-apex; veins dark brown. Venation: *Rs* long, angulated and spurred at origin; R_{2+3} a little shorter than the deflection of R_{4+5}; petiole of cell M_1 nearly twice *m*; basal deflection of Cu_1 near mid-length of cell 1*st* M_2. Wings of the ♀ proportionately smaller than those of the ♂, but normal in other regards.

Abdominal tergites dark grey; segments 2 to 5 with a dark median blotch; tergites 5 to 7 narrowly ringed caudally with obscure yellow; hypopygium reddish brown; sternites light brown, the caudal margins broadly and conspicuously pale. Male hypopygium with the ninth tergite narrowed apically, the tip with a small U-shaped notch. Ninth sternite profoundly incised medially, each meso-apical angle produced into a slender blackened lobe that bears a conspicuous tuft of yellow setæ. Basistyles slender, the mesal face of each produced into a conspicuous,

pale, clavate lobe that is densely tufted with yellow setæ : outer dististyle very strongly expanded at apex into a triangular blackened blade, the margin truncated to feebly concave ; inner dististyle pale, the apex suddenly narrowed. Ædeagus slender, the margin near apex serrulate. Ovipositor with very long, slender valves.

Hab. New Zealand (South Island).

Holotype, ♂, Hunter Range, Lake Manapouri, Southland, altitude 4000 feet, January 1–7, 1923 (*S. Lindsay*).

Allotopotype, ♀.

Paratopotype, ♂.

Gynoplistia bituberculata, sp. n.

General coloration grey, the præscutum with three broad but rather ill-defined brown stripes ; antennæ with 16 segments, the branches short ; femora dark brown, with a rather ill-defined reddish subterminal ring ; wings relatively narrow, yellowish, the cord and base of *Rs* seamed with brown ; abdomen dark grey ; male hypopygium reddish, the outer dististyle notched at apex.

Male.—Length about 10·5 mm. ; wing 9·5 mm.

Female.—Length about 12 mm. ; wing 7·5 mm.

Rostrum and palpi black. Antennæ 16-segmented in both sexes, the formula in the ♂ being 2+2+7+5, the last segment being enlarged and nearly as long as the preceding two segments taken together and evidently a fusion-product ; antennæ black, the basal segment pruinose ; longest flagellar branch only a trifle greater than twice the length of the segment. In the ♀ the basal four segments are short-pectinate. Head grey, the vertex on either side of the median line infuscated, forming a ∩-shaped marking.

Mesonotum dull grey, the præscutum with rather ill-defined brown stripes, the median stripe becoming obliterated near mid-length of the sclerite, the lateral stripes broader than usual and lying far laterad ; pseudosutural foveæ very conspicuous, black ; scutal lobes darkened. Pleura light grey. Halteres pale brownish yellow, the apices of the knobs dark brown. Legs with the coxæ salmon-coloured ; trochanters obscure yellow ; femora brown, the bases brownish yellow : a rather ill-defined reddish ring before the subequal dark tips of the femora ; tibiæ light brownish yellow, the tips very indistinctly darkened ; tarsal segments 1 to 3 brownish yellow, the tips blackened ; terminal tarsal segments black. Wings relatively long and narrow, strongly tinged with yellow, the

base and costal region more saturated ; stigma dark brown ; narrow but elongate brown seams at origin of *Rs*, along the cord and the outer end of cell 1*st* M_2 ; veins yellow, dark brown in the infuscated areas. Venation : *Rs* long ; R_{2+3} about twice the arcuated basal deflection of R_{1+5} ; cell M_1 about one-third longer than its petiole ; basal deflection of Cu_1 at near mid-length of cell 1*st* M_2.

Abdomen dark grey, the tergites with a nearly continuous brown median stripe, narrowly interrupted at the extreme apex of each segment ; hypopygium reddish ; sternites reddish brown with a capillary median brown line ; subterminal sternites in ♀ darkened. Male hypopygium with the ninth tergite terminating in two small rounded tubercles, separated from one another by a space about equal in width to one. Basistyles slender, at base of each a slender, curved, blackened hook ; outer dististyle rather short, the apex notched, thus appearing to form two short acute spines at extreme tip ; surface of dististyle with about six long conspicuous setæ ; inner dististyle about equal in length, the basal three-fifths dilated, the apical two-fifths slender. Ædeagus bifid at apex. Ovipositor with the valves long and slender.

Hab. New Zealand (South Island).

Holotype, ♂, Hunter Range, Lake Manapouri, Southland, altitude 4000 feet, January 1–7, 1923 (*S. Lindsay*).

Allotopotype, ♀.

Gynoplistia pleuralis, sp. n.

General coloration of dorsum shiny brown ; dorsal pleurites dark brown, the sterno-pleura, coxæ, and trochanters light yellow ; wings tinged with grey, with two incomplete brown cross-bands, the one at the cord very broad ; dorso-apical lobe of basistyles of male hypopygium a flattened blade.

Male.—Length, excluding head, about 6·8 mm. ; wing 8 mm.

Rostrum shiny testaceous, the mouth-parts and palpi brownish black. Antennæ 16-segmented, the formula being 2+2+9+3, or, in cases, 2+2+10+2 ; scape and rhachis of two basal flagellar segments brownish yellow, the remainder of the organ black. Head dark brownish grey.

Mesonotal præscutum shiny yellowish brown, unmarked, the remainder of the mesonotum a little darker brown. Dorsal pleurites, including the dorso-pleural membrane, dark brown, this broad stripe including the dorsal portions

of the sterno-pleura and the entire pleuro-tergite of the postnotum; remainder of sterno-pleura and the meron light yellow. Halteres pale brown, the knobs and distal portion of the stem dark brown. Legs with the coxæ and trochanters light yellow; femora brown, the terminal tarsal segments darker; tibial spurs slender with appressed black setæ. Wings tinged with grey; an interrupted brown cross-band at the level of the origin of *Rs* this rather broad, interrupted at vein *Cu*; a very broad band extending from the stigma to the fork of *Cu*, leaving the centre of cell 1*st* M_2 of the ground-colour; wing-apex clear; veins dark brown. Venation: Sc_1 ending just before the fork of *Rs*, Sc_2 at its tip; R_{2+3} very short, about equal to *m*; veins R_2 and R_3 divergent; cell 1*st* M_2 short-rectangular; basal deflection of Cu_1 about two-fifths its length beyond the fork of *M*.

Abdominal tergites dark brown, the sternites obscure brownish yellow; hypopygium dark. Male hypopygium with the dorso-apical angle of basistyle produced caudomesad into a flattened blade, this slightly expanded distally, the caudal margin gently rounded, the surface with sparse long setæ; outer dististyle slender, sinuous, the apex bifid, the inner margin beyond mid-length expanded into a weak wing; inner dististyle shorter, more nearly straight, with numerous tiny setæ and a few longer ones along the cephalic margin. Gonapophyses appearing as long blades, widest beyond mid-length, thence tapering rapidly to the apex. Interbasal lobes appearing as stout spines directed caudad along the mesal face of the basistyle. Ædeagus very broad at base.

Hab. New Zealand (both Islands).

Holotype, ♂, Ohakune to mountain-hut on Ruapehu, altitude 3000–4500 feet, January 12, 1923 (*T. R. Harris*).

Paratypes, 4 ♂♂, Greymouth, Westland, Coal Creek track, February 13, 1923 (*T. R. Harris*).

In its general coloration, *Gynoplistia pleuralis* suggests the smaller *G. trifasciata*, Edwards, an otherwise different fly.

Gynoplistia lobulifera, sp. n.

General coloration shiny black, including the hypopygium; dorsal thoracic pleurites conspicuously silvery; legs black, the femoral bases broadly obscure yellow; wings with a conspicuous brown pattern, the wing-apex broadly clouded; male hypopygium with the mesal face of basistyle bearing a slender setiferous lobule that is directed cephalad.

Male.—Length about 4·8 mm. ; wing 5·6–6 mm.

Rostrum and palpi black. Antennæ probably with fifteen segments, the terminal segments broken, the formula being 2+2+6+?; antennæ brownish black throughout, the longest flabellation approximately one-half the length of the flagellum. Head shiny black.

Pronotum and mesonotum entirely shiny black. Pleura black, the dorsal pleurites with an extensive microscopic silvery pubescence that simulates a bloom. Sterna shiny black. Halteres obscure yellow, the knobs infuscated. Legs with coxæ black; trochanters obscure yellow; femora obscure yellow, the tips enlarged and blackened, this more extensive and accentuated on the posterior femora; tibiæ brownish black; tarsi black. Wings subhyaline, with a conspicuous brown pattern; a large circular area at origin of *Rs*; stigma brown, sending a broad seam along the cord almost to the wing-margin; wing-tip extensively clouded with paler brown, this including all of cell M_1; a pale brown seam occupies the basal half or more of cell *Cu*; veins black. Venation: Sc_1 ending just before the fork of *Rs*, Sc_2 at its tip; R_{2-3} about two-thirds the deflection of R_{4-5}; *r* about twice its length from the tip of R_1; cell 1*st* M_2 small, rectangular; petiole of cell M_1 shorter than or equal to the cell; basal deflection of Cu_1 near mid-length of cell 1*st* M_2.

Abdomen black, including the hypopygium. Male hypopygium with the basistyles stout, the apical angle produced caudad into a slender digitiform lobe; mesal face of basistyle with a small but conspicuous lobule, directed cephalad, the surface densely provided with conspicuous setiferous tubercles, the terminal setæ longest; interbasal lobe a sinuous chitinized spine, broadest basally. Outer dististyle yellow, slender, the apex dilated into a conspicuous bifid blade; inner style a little shorter, the apex feebly expanded, the surface with microscopic setulæ. Gonapophyses appearing as broad blades directed caudad and slightly mesad, profoundly bifid at apex, the lateral arm being very slender, acute. Ædeagus broad-based.

Hab. New Zealand (North Island).

Holotype. ♂. Ohakune to mountain-hut on Ruapehu, altitude 3000–4500 feet, January 12, 1923 (*T. R. Harris*).

Paratopotype. ♂, January 15, 1923.

Gynoplistia recurvata, sp. n.

General coloration shiny black, including the pleura and hypopygium; antennæ with fifteen segments; wings with a

conspicuous brown pattern, the apex clear; *Rs* long, *Sc* ending about opposite two-thirds its length: male hypopygium with the gonapophyses very large and powerful, recurved, the apices being directed mesad.

Male.—Length about 5 mm.; wing 5·5-5·6 mm.

Female.—Length 6·3 mm.; wing 5·7 mm.

Rostrum black, the mouth-parts brownish yellow; palpi dark brown. Antennæ 15-segmented, the formula being 2+2+6+5; basal segment of scape dark, the second segment obscure yellow: basal flagellar segments with the apex of each obscure yellow, the remainder of the organ black; longest flabellation fully three-fifths the length of the flagellum. Head shiny black.

Pronotum, mesonotum, and pleura shiny black. Halteres obscure yellow, the knobs conspicuously dark brown. Legs with the coxæ and trochanters light yellow: femora yellow, the tips clubbed and blackened, most extensively on the posterior legs; tibiæ brown, the tips blackened, the posterior tibiæ paler, dirty brownish white, the tips dark brown; tarsi brownish black. Wings subhyaline with a brown pattern; a large subquadrate area at origin of *Rs*, in alignment with a cloud in the outer end of cell 1*st A*, but cell *M* entirely clear; a conspicuous seam along the cord, extending more or less completely across the wing but leaving the centre of cell 1*st* M_2 clear; wing-apex clear; veins dark brown. Venation: *Sc* short, Sc_1 ending about opposite two-thirds the length of the long *Rs*, Sc_2 close to its tip; *Rs* long, angulated at origin; R_{1+2} short to very short; veins R_2 and R_3 strongly divergent; cell 1*st* M_1 subirregular, *m* being about one-half the outer deflection of M_3; petiole of cell M_1 variable, sometimes a little shorter, in other cases a little longer than the cell; basal deflection of Cu_1 at or beyond mid-length of cell 1*st* M_2.

Abdomen black, including the hypopygium. Male hypopygium very complex in structure. Basistyles stout, the apical angle produced caudad and mesad into a slender glabrous lobe; the interbasal structure terminates in a large yellow blade, the caudal margin of which is coarsely serrate. Dististyles narrowly united basally; outer style tapering to the simple slightly curved pale apex: inner style shorter but broader, setiferous apically. Gonapophyses arising as powerful arms on either side of the aedeagus, directed laterad, thence caudad, and finally curved back upon themselves, directed mesad, their apices overlying one another in the median field of the genital chamber; apex of each arm dilated into an oval, terminating in a nipple.

Ovipositor with the very long, slender valves obscure horn-yellow.

Hab. New Zealand (North Island).

Holotype, ♂, Ohakune, altitude 2060 feet, December 5, 1922 (*T. R. Harris*).

Allotopotype, ♀, December 12, 1922 (*T. R. Harris*).

Paratopotypes, 7 ♂♂, December 1–12, 1922 (*T. R. Harris*).

Macromastix holochlora angustior, subsp. n.

Male.—Length 11·5–12 mm.; wing 15·5–16 mm.

Generally similar to typical *holochlora* (Nowicky), differing as follows:—

First flagellar segment distinctly shorter than the second. Femoral and tibial apices dark brown. Wings with a strong greyish tinge, the stigma infuscated; veins dark brown instead of green. Venation: *Rs* shorter and straighter; cell *2nd A* long and narrow. Apical tergites of abdomen distinctly infuscated. Lobes of the ninth tergite of male hypopygium more evenly rounded.

Hab. New Zealand (both Islands).

Holotype, ♂, Ohakune, altitude 2060 feet, December 31, 1922 (*T. R. Harris*).

Paratopotype, ♂, January 5, 1923 (*T. R. Harris*).

In his recent revision of the New Zealand Tipuloidea, Edwards recognised this subspecies as distinct (as his variety *b*), but did not give it a name. His material of this race was from Te Wairoa, North Island, and West Plains, South Island. Both subspecies have the pronotum clear green, the præscutum with three obscure orange stripes; the scutal lobes with obscure orange centres; the head green with the orbits and genæ obscure orange.

XXII.—*Papers on Oriental* Carabidæ.—X.

By H. E. Andrewes.

In this paper I am describing some new species from Indo-China, some of which occur also in North India, and one species from Quelpart Island, Korea. The type-specimens, except as otherwise indicated, are in my collection.

Scaritini.

Scarites estriatus, Fairm. Ann. Soc. Ent. Belg. 1887, p. 93.

Until quite recently I had seen no example of this species,

which was described by the author from Fokien in China, but a specimen recently taken by Mr. S. F. Light at Foochow, in the Province of Fokien, agrees so well with the description that I feel no hesitation in identifying it with *estriatus*, although I have not seen Fairmaire's type. A series of examples from Tonkin agrees exactly with the Foochow specimen. I can see nothing to distinguish the species from *S. ceylonicus*, Chaud. (Mon. des Scaritides (ii.), Ann. Soc. Ent. Belg. 1880, p. 85), except the presence of a single puncture at the apex of the elytra instead of two. It happens, however, that a solitary specimen in the Tonkin series has two punctures, which seems to confirm the close relationship between the two, and I propose to treat Fairmaire's *estriatus* as a variety only of Chaudoir's species.

Pogonini.

Lissopogonus, gen. nov.

Head with deep furrows, bounded outwardly by a carina, the hind supraorbital pore placed far back just outside its termination, narrowed behind eyes, neck moderately constricted at some distance behind eyes, ligula bisetose, paraglossæ extending for some little way beyond it, labrum moderately emarginate, eyes not prominent, mandibles strong, sharply hooked at apex, slightly toothed near base, a seta in the scrobe, mentum with a short simple tooth, the lobes rounded outwardly at base and thence nearly straight to the slightly rounded apex, epilobes wide, forming a tooth on inner margin of lobes, but not nearly reaching their apex, apical joint of palpi truncate, last two joints of labials of equal length, the penultimate bisetose, maxillaries glabrous, apical joint half as long again as penultimate, antennæ stout, pilose from base of joint 3. *Prothorax* narrowly cordate, with two marginal setæ on each side, the front one far forward, the hind one in front of the angle, median line deep, very deep and wide at base (as in *Pseudolimnæum*). *Elytra* oval, border forming an angle at shoulder, basal border very crooked, not quite reaching scutellum, one impressed dorsal stria (sutural), which is very deep at base, 8 visible close to apex, no scutellary striole, a single dorsal pore on interval 3 just before middle, marginal channel with few and inconspicuous setiferous pores. Pro- and mesosterna deeply furrowed, m tasternal process strongly bordered between mesocoxæ, ventral segments bordered, with a single seta on each side, last one with one seta in ♂, two

in ♀. Legs rather short, tarsal joints short, glabrous above, without furrow, joint 4 emarginate, ♂ protarsi with hardly dilated joints.

The new species for which this genus is proposed fits fairly well into the group of the Pogonini, but in some of its characters, and especially in its smooth elytra, it differs widely from any other species of the group known to me.

Lissopogonus glabellus, sp. n.

Length 4·75–6·0 mm.; width 1·8–2·3 mm.

Black and very shiny, venter piceous, legs testaceous (middle of femora and tibiæ sometimes piceous), joints 1–2 of antennæ and an apical rounded spot on each elytron, covering approximately intervals 3–8, reddish.

Head moderately convex, genæ sloping very gently backwards, a fine ridge running back from inner margin of eye, parallel with and terminating at same level as the frontal ridge, surface smooth, finely punctate in the neck constriction and with a few punctures on each side of front, joint 1 of antennæ twice as long as 2, 3 three times as long, the remainder approximately equal to 1. *Prothorax* convex, a little wider than head, but much wider than long, base bisinuate with slightly oblique sides, the sides moderately rounded and sinuate a little before base, hind angles sharply right, projecting a little laterally, a slight carina in front of them (as often in *Bembidium*), basal sulcus deep, containing three large pores on each side, of which the outer one is largest, extends furthest towards base, and is bounded outwardly by a small ridge, surface smooth and polished. *Elytra* convex, stria 1 deepening at base, curving outwards, and joining the slight channel behind basal border, fragments of both 7 and 8 are visible close to apex, the other striæ faintly visible under a strong lens as rows of minute pores, marginal channel with few and inconspicuous setiferous pores.

Sikkim: Gopaldhara, Namsoo, Birik, and Gielle Khola in the Tista Valley (all *H. Stevens*). Assam: Rotung, 1400 ft. (*S. W. Kemp*—Ind. Mus.). Kumaon: West Almora, Tanakpur, and River Sarda Gorge (all *H. G. Champion*); Dehra Dun–Kali Gad, Mussoorie–Arni Gad, and Siwaliks–Lachiwala (all *Dr. M. Cameron*—Forest Res. Inst.). Laos: Lak Mune (*R. Vitalis de Salvaza*). Numerous examples. The type (Namsoo) is in my collection.

The examples from Laos are a little smaller and darker than the Indian specimens.

Chlæniini.

Ch'ænius adonis, sp. n.

Length 16·0–16·5 mm. ; width 6·0–6·25 mm.

Head and prothorax metallic green, latter slightly cupreous, underside piceous ; labrum, palpi, and joints 1–3 of antennæ (rest brown) testaceous; legs, margin of venter, and elytra flavous. On the elytra there is an elongate median blackish patch, faintly green near base, covering intervals 1–6 on each side at base, contracted sharply at two-fifths to stria 2, thence narrowing very gently and disappearing just before apex : in the type the patch widens again for a short distance just behind middle, and opposite this dilation are two slight elongate lines at each side on the inner part of interval 5.

Head nearly smooth in front, punctate at sides and behind, labrum truncate, eyes prominent, palpi slender, joint 3 of antennæ slightly pilose, much longer than 4. *Prothoraæ* rather convex and a little transverse, sides strongly rounded and very slightly sinuate behind, the hind angles obtuse and rounded ; median line faint, basal impressions small and rounded, surface rather densely, coarsely, and here and there confluently punctate, pubescent. *Elytra* ovate, moderately convex, and rather wide, quite half as wide again as prothorax, border forming a distinct though obtuse angle at shoulder; striæ fairly deep and minutely punctate, intervals slightly convex, surface closely and finely punctate, and shortly pubescent. Prosternum very coarsely, rest of sterna moderately punctate, venter sparsely and minutely punctate and pubescent, prosternal process bordered, metepisterna a little longer than wide, not sulcate, tarsi pubescent above, dilated joints ♂ rather wide.

Very close to *C. maculatus*, Dej., but with quite a differ nt elytral pattern. A little larger, but similar in form. Joint 3 of the antennæ relatively longer, eyes larger and more prominent, hind angles of prothorax more rounded, the surface rather more coarsely punctate, elytra a little wider, the puncturation a little clearer and less asperate.

Annam : Phuc-Son, 3 ex., all ♂.

Chlænius cæsitius, sp. n.

Length 8·0–8·5 mm. ; width 3·3 mm.

Rather dull greyish green, head and prothorax a little brighter, the former faintly bluish, underside piceous and slightly iridescent ; labrum, palpi, antennæ (darker towards

apex), and borders of elytra and venter flavous. The elytral border extends inwards to stria 7, but is dilated and a little jagged at apex.

Head convex, punctate, but with a nearly smooth area on vertex, labrum truncate with a rounded depression at middle, palpi slender, joint 3 of antennæ moderately pilose, a little longer than 4. *Prothorax* convex, slightly transverse, with rounded sides, sinuate near hind angles, which would be right but that the sides of base are a little oblique ; median line extremely fine, basal foveæ rather narrow but fairly deep, surface pubescent, coarsely, densely, and a little confluently punctate. *Elytra* oval, moderately convex, half as wide again as prothorax, and two-thirds as long again as wide, border forming an obtuse angle at shoulder ; striæ shallow, finely punctate, but more coarsely near base, intervals nearly flat, surface with a conspicuous light pubescence, finely asperate-punctate. Prosternum coarsely and densely, rest of sterna more moderately, venter finely and not very closely punctate, metepisterna longer than wide, not sulcate, upper surface of femora and tarsi densely pubescent, protarsi in ♂ with rounded joints.

Very near *C. callichloris*, Bates, but the elytra have a wider flavous border, dilated at a greater distance from apex and less jagged. The head is not so smooth on vertex and in front, the prothorax rather narrower, less densely punctate, with less evident sinuation before hind angles, the elytra a little longer, with rather finer striæ, the surface similar.

Annam : Phuc-Son, 4 ex.

Pterostichini.

Pterostichus touzalini, sp. n.

Length 20·5–21·0 mm. ; width 6·2–6·75 mm.

Black, shiny ; palpi, joint 1 of antennæ, tibiæ, and tarsi dark red to piceous.

Head (4 mm. wide) moderately convex, smooth, frontal furrows short and shallow, diverging slightly behind, eyes moderately prominent, genæ evident, oblique to neck, labrum faintly emarginate, antennæ rather short and thick. *Prothorax* (5·2 mm. wide and 4·8 mm. long) convex at sides, slightly cordiform and widest at two-fifths from apex, extremities slightly emarginate, sides bisetose, with a narrow reflexed border, moderately rounded in front, gently sinuate behind, hind angles right but rounded; median line distinct, not reaching extremities, transverse impressions obsolete,

basal foveæ linear, elongate, deep near base only, which they do not quite reach, diverging both in front and behind, surface smooth, finely and rather indistinctly punctate near hind angles, marginal channel finely crenulate. *Elytra* (6·6 mm. wide and 11·0 mm. long) ovate, widest rather behind middle, border forming an obtuse angle at shoulders, which are narrow and inconspicuous, marginal channel wide, sides very faintly sinuate near apex; striæ deep, impunctate, intervals moderately convex, 3 with four to five pores, the first adjoining stria 3, the others adjoining stria 2, surface smooth. Underside smooth; prosternal process channelled, not bordered, metepisterna very small, as long as wide, tarsal joint 5 glabrous beneath. The apical ventral segment ♂ has a deep pit in the middle, behind which the margin expands downwards into a thin, slightly asymmetrical prominence.

P. sphodriformis, Bates, is nearly allied, but has the red parts lighter in colour. Bates's species, too, has antennæ with longer and more slender joints, the prothorax with less rounded hind angles, more reflexed border, the foveæ reaching base, the elytra narrower, elliptical rather than ovate, the intervals a little more convex, 8 much narrower than the others, 3 with only three pores.

Korea: Quelpart Island, 4 ex., ♂ ♀ (coll. H. de Touzalin), 1 ex. (British Museum). Mr. de Touzalin has kindly allowed me to retain the type in my collection.

Trigonotoma chalcodes, sp. n.

Length 19·0–21·0 mm.; width 7·0–7·5 mm.

Black, shiny, upper surface dark bronze, antennæ towards apex and palpi brown.

Head elongate, convex, neck dilated, frontal foveæ deep and sinuate, not reaching beyond mid-eye level, clypeus slightly, labrum more distinctly emarginate, eyes projecting very little laterally, mentum very wide, with a short, rounded, and bordered tooth, last joint of labial palpi ♂ strongly securiform, ♀ triangular, more elongate, and dilated gradually to apex, antennæ short, joint 1 equalling 2–4, not reaching base of prothorax. *Prothorax* moderately convex, a third as wide again as long, sides of base a little oblique, narrower than apex, which is truncate, sides strongly rounded and sharply sinuate a little before hind angles, which are right, though projecting somewhat laterally, border thick, gradually widening behind up to the sinuation; median line fine, transverse impressions clearly marked, though not deep,

basal foveæ deep, close to angles, curving outwards in front and joining marginal channel, surface smooth in two examples, showing some shallow cross-striation in the third. *Elytra* convex, about a fourth as wide again as prothorax and half as long again as wide, shoulders rounded, margin very slightly sinuate behind, epipleuræ longitudinally grooved at base, with some faint punctures in the groove; striæ deep, very distinctly crenulate, scutellary striole short, generally ending in one or two detached punctures, intervals rather flat, becoming convex near extremity. Prosternum smooth, meso- and metasterna, also base of venter at sides with some coarse punctures, metepisterna much longer than wide, last ventral segment ♂ ♀ with a single seta on each side. Joint 1 of hind tarsi with a faint external groove, joint 5 setulose beneath.

Similar in some respects to *T. chalceola*, Bates, but much larger and a little more brightly coloured. Head and elytra very much the same, elytral intervals a little flatter, form of prothorax quite different, the sides sharply sinuate behind, the hind angles right, the surface impunctate.

Cochin China: Reu Hai (*R. P. Guerlach*), 1 ex. Laos, 2 ex. I am indebted for the first specimen to Mr. René Oberthür, who has other examples in his collection.

Anchomenini.

Anchomenus luteus, sp. n.

Length 7·0–7·5 mm.; width 2·75–2·90 mm.

Dull yellowish in colour, metasternum with episterna and basal ventral segment black, joints 5–11 of antennæ fuscous.

Head convex, smooth, frontal furrows short but deep, curving outwards to the front supraorbital, clypeal suture fine, eyes moderately prominent, antennæ long, reaching middle of elytra, joints 1–3 glabrous, 3 slightly curved, a little shorter than 4. *Prothorax* moderately convex, cordate, a little wider than head, and nearly half as wide again as long, sides of base oblique, sides rounded in front, bisetose, slightly sinuate near base, hind angles a little obtuse but not rounded; median line moderately impressed, a little deeper behind, foveæ fairly deep, disk smooth, basal area densely and confluently punctate, apical margin and sides finely and less densely punctate. *Elytra* oval, moderately convex, nearly twice as wide as prothorax, and half as wide again as long, shoulders rather prominent, base bisinuate; striæ deep, clearly and closely punctate, striole rather short,

intervals convex, more so at sides, 3 with three punctures, marginal series widely spaced in middle, surface smooth, but only moderately shiny. Pro- and metepisterna, sides of metasternum, and of venter at base punctate, metepisterna elongate; last ventral segment with one seta on each side in ♂, two in ♀. Tarsal joints slightly grooved, 4 only faintly emarginate.

Not unlike *Colpodes annulicornis*, Maindr., in form, but smaller and yellow instead of black. Head smooth, with shallower frontal foveæ, and thicker antennæ; prothorax a good deal wider and with more obtuse angles; elytra with more rounded sides, apex not mucronate, intervals more convex, the pores on 3 smaller.

Laos: Ban Sop Vi, Ban Samang, Muong Hai, and Pac Hang (*R. Vitalis de Salvaza*). The type is in the British Museum.

Anchomenus comatus, sp. n.

Length 8·25–10·0 mm.; width 3·25–4·0 mm.

Though possessing some characters of its own, this species bears so strong a resemblance to the preceding one that I shall confine myself to indicating the points in which it differs. Size considerably larger; colour similar, except that the whole of the venter is black, and the elytra sometimes tend to become infuscate on disk.

Head with rather shorter furrows, a few fine punctures on neck, joint 3 of antennæ hardly shorter than 4. *Prothoraæ* of similar shape and sculpture, but more punctate along sides in front, and with four or five setæ along front half of sides. *Elytra* not quite so convex, the punctures in the striæ a little larger, the intervals a little wider and flatter, 3 and 5 each with from four to six setiferous pores, marginal series uninterrupted. *Underside* more or less punctate throughout, except middle of venter, ventral segments with two or three setæ on each side of median line, apical segment ♂ ♀ with about four on each side, legs more densely setulose.

The unusual number of tactile setæ present in this species differentiate it at once from all its congeners, and will probably necessitate at least a new subgenus when the Oriental species of *Anchomenus* are better known.

Kumaon: West Almora, Tanakpur, and Ranikhet (*H. G. Champion*): Dehra Dun (*Dr. M. Cameron*—Forest Res. Inst.). Assam: Kobo, 400 feet, and Bank of Dihong below Pasighat (*Dr. S. W. Kemp*—Ind. Mus.). Eastern Duars (*H. Stevens*). Tonkin: Bao Lac (coll. Fleutiaux).

In some instances the elytra are entirely black, and this occurs in Indo-China as well as in India. I call this var. *nigriculus*. The localities are the same as those mentioned above.

Odacanthini.

Arame obesa, sp. n.

Length 6·5–7·0 mm. ; width 2·0–2·25 mm.

Black, shiny; upper surface rather faintly metallic green ; palpi, basal three and a half joints of antennæ (rest fuscous), legs, epipleuræ of elytra (to some extent), and apical margin (rather narrowly) flavous.

Head wide, convex, and quite smooth, semicircular in outline behind, frontal foveæ short but deep, more or less joined by a transverse depression behind, eyes rather flat, antennæ slender. *Prothorax* convex, a little narrower and hardly longer than head, not much longer than wide, sides rounded in front, then sinuate and straight to base, the hind angles right, moderately constricted at basal fourth; median line rather fine, surface smooth, with a little faint cross-striation, basal area closely and coarsely punctate. *Elytra* convex, quite twice as wide as head, and half as long again as wide, shoulders well marked, sides nearly parallel, apex obliquely truncate ; striæ punctate, clearly impressed at base, but much fainter towards apex, intervals flat, 3 with four evenly distributed pores, though the two hind ones are not far apart, 5 and 7 without punctures ; surface smooth and glossy, showing under the microscope a very distinct isodiametric reticulation, which is not present on either head or prothorax. Underside very smooth and shiny, with some large punctures at base of proepisterna, sides of metasternum, and on the metepisterna ; fourth tarsal joint rather strongly emarginate.

Allied to *A. metallica*, Fairm., but a much wider insect, the metallic coloration much less pronounced, the light parts flavous rather than testaceous. Head a little wider and very much shorter, prothorax wider, sides more rounded, base a little more coarsely punctate, elytra wider, the outer angle of the apical truncature rounded, four setiferous pores on interval 3, whereas in Fairmaire's species there are numerous pores with long erect setæ on all the odd intervals.

Malay States: Singapore, 4 ex. (*Dr. M. Cameron* (type)—my coll., 2 ex., *Hon. C. J. Saunders*—Saunders coll., 1 ex., and Raffles Museum, 1 ex.); Klang–Blackwater Estate, 1 ex. Cochin China, 1 ex. (coll. Sloane).

Brachynini.

Pheropsophus scythropus, sp. n.

Length 12·0–16·0 mm.; width 4·5–5·2 mm.

Black, venter piceous; head in front of eyes and beneath, epipleuræ (at base), apical margin of elytra (very narrowly), prosternal process, metasternum, palpi, and antennæ (darker towards apex) testaceous.

Head convex, smooth, wrinkled behind and generally with two or three large punctures near eye, frontal foveæ shallow, a small rounded depression on each side opposite eye, eyes moderately prominent, antennæ long and thick, reaching beyond middle of elytra. *Prothorax* convex, as wide as head, and a little longer than wide, sides gently rounded in front and sinuate behind, the hind angles right and sharp, projecting faintly laterally; median line slight, deeper behind at its junction with the clearly marked transverse impression; surface smooth, a few small punctures at sides of base. *Elytra* convex, not quite twice as wide as prothorax, the shoulders obliterated, apical truncature with a very distinct re-entrant angle at suture; the costæ rather narrow, smooth, the outer ones finer, 8 (counting suture as 1) not reaching apex, intervals between the costæ finely aciculate, 1 a little and 8 a good deal wider than the others. Underside finely punctate and pilose, procpisterna smooth. Insect apterous.

In some examples the sides of the head are black beneath, and in one instance the whole surface is black above and beneath. The eyes are flatter in some specimens, and in others the elytral costæ are finer than in the type.

The species is evidently allied to *P. aptinoides*, Chaud., a much larger insect, with yellow head and black knees. Chaudoir compares his species with *P. senegalensis*, Dej., and a similar comparison with *P. scythropus* makes it evident that the two Indian species are distinct. I think the new one is probably identical with *P. melancholicus*, Chaud. (not Schm. Goeb.).

Sikkim: Gopaldhara (*H. Stevens*—type): Kurseong (*N. Annandale*); Pashok (*F. H. Gravely*); Mungphu (*Atkinson*). Assam: Shillong (*T. B. Fletcher*); Khasi Hills (*H. H. Godwin-Austen*). Tibet: Pedong (*A. Desgodins*). British Bhotan: Maria Basti (*L. Durel*).

Specimens from Indo-China vary in length from 11 to 17 mm. The average size is about the same, and the coloration is similar, except that the head is entirely black

(as in one Indian example). The prothorax is rather longer and narrower, with less rounded sides, and more distinct traces of puncturation, which (though slight) usually extends along sides to front margin. The elytra are similar in shape, but the costæ are a little less pronounced, and 6 (counting sutural one) is wanting, or at least imperfectly developed, on basal fourth. I propose to call this form var. *dissolutus*.

Laos: Ban Sai, Pang Bo, and "La Cascade," near Xieng Khouang (*R. Vitalis de Salvaza*). The type is in the British Museum.

Two examples in the British Museum, from Manipur and the Ruby Mines (*Doherty*) respectively, seem to connect the two forms; the head and prothorax are as in the typical form, but the sixth costa is wanting near base, and in the Manipur example the third and fifth costæ are wider than the others.

Brachynus lesnei, sp. n.

Brachynus sexmaculatus, Lesne (not Dej.), Mission Pavie, Histoire Naturelle, 1904, p. 79.

Length 8·5–12·0 mm.; width 3·30–4·50 mm.

Colour light testaceous, meso- and metepisterna, sides of venter and margins of the segments more or less piceous; prothorax with border and (in the type) a broad stripe on each side of median line piceous (in the second specimen the colour is rather washed out on disk, and in the third it has quite disappeared, leaving only the base and apex dark); elytra black with testaceous markings, viz., an elongate shoulder-spot, an irregularly indented spot on middle of elytron towards apex, a smaller spot at outer angle of apical truncature, the margin, and a very vague area at the sides behind, on which the costæ always remain black; joints 5–11 of antennæ and apex of palpi fuscous.

Head nearly smooth, a few punctures at sides behind, eyes fairly prominent. *Prothorax* as long as wide, not quite as wide as head, sides slightly rounded in front, strongly sinuate towards base, hind angles sharp and projecting laterally; median line fairly deep, surface very finely and not at all closely punctate, with some slight cross-striation. *Elytra* narrowed in front, but with fairly evident shoulders, truncate behind, intervals carinate, the striæ between them very fine and extremely finely punctate, the fairly wide membranous apical border glabrous. Underside finely punctate, head and prosternum sparsely, proepisterna nearly smooth, sides of venter very closely. The pubescence is short and very

sparse on head and prothorax, inconspicuous on elytra, though more evident towards apex, very conspicuous on venter. Insect winged.

Closely allied to *B. sexpunctatus*, Dej., but on average a little smaller, similar in shape and nearly so in coloration and markings, but in Dejean's species the prothorax, like the head, is of a uniform testaceous red, the light colour on the elytra does not extend vaguely over disk behind, the spot towards apex is nearly round and placed further forward. In the new species the prothorax is a little narrower, and the elytral intervals distinctly carinate.

Siam: between Chantaboum and Battambang, 1886 (*A. Pavie*), 3 ex. The type is in the Paris Museum and a cotype in my collection. It is with pleasure that I name the species after Mr. P. Lesne, who at my request very kindly sent me the specimens for examination.

XXIII.—*Further Notes on the* Castniinæ *in the Collection of Madame Gaston Fournier* [*Lepidoptera*]. By Percy I. Lathy, F.E.S.

Since writing my account of the specimens of this family contained in the above collection (Ann. & Mag. Nat. Hist. ser. 9, vol. ix. p. 68, Jan. 1922), Madame Fournier has considerably added to it. As these additions include many rarities not before represented in the collection and a certain number of new forms and hitherto unknown females, I hope that the present paper, which deals with these, may prove to be of interest to students of this family.

Cyparissias dedalus conspicua, Rothsch.

Castnia (*Cyparissias*) *dedalus conspicua*, Rothsch. Novit. Zool. xxvi. p. 2 (1919).

A single female received from Cuyaba, Matto Grosso, agrees with the aberration described by Rothschild under the name of *magnipuncta*.

Eupalamides zerynthia, Gray.

Castnia zerynthia, Gray, Trans. Ent. Soc. Lond. 1838, p. 144.

A single male of this species from the Leeman Collection.

Corybantes govara, Schaus.

Castnia govara, Schaus, Journ. New York Entom. Soc. vol. iv. p. 147 (1896).

A male of this rare species from Muzo, Columbia. The discal area of the hind wing above is entirely black.

Castniomera atymnius joiceyi, subsp. nov.

Fore wings as in *Atymnius humboldtii*, Boisd., but hind wings with discal white patch smaller and ending at vein 5, instead of being produced towards costa; in this respect the hind-wing pattern resembles that of *Castniomera drucei*, Schaus, but the colour is that of *humboldtii*.

1 ♂, Lower Maroni, French Guiana.

Castnia licoides, Boisd.

Castnia licoides, Boisd. Spec. Gén. Lépid. Hét. p. 527, pl. i. (1874).

A series from Dutch Guiana, which also includes the aberration *licoidella*, Strand. Fassl found this aberration at Teffé, Amazons.

Castnia laura, Druce.

Castnia laura, Druce, Ann. & Mag. Nat. Hist. (6) xvii. 1896, p. 216.

Hitherto this species has only been known by the type-specimen, now in the Joicey collection. Madame Fournier has been fortunate enough to obtain a series of six males and two females from Uberaba, Minas Geraes.

It might almost be described as a *syphax* with a white band crossing the posterior wings. The sexes do not differ from each other.

Graya dalmanii, Gray.

Castnia dalmanii, Gray, Trans. Ent. Lond. 1837, p. 145.

The series now consists of 10 ♂ ♂ and one specimen of the hitherto unknown female, of which I append the description.

Much larger than the male, and wings more rounded, especially hind wing; cellular spot of fore wing larger and more distinct; transverse white band wider; beyond this band, but close to it, a very small white spot between veins 7 and 8, a conspicuous heart-shaped white spot between 5 and 6, and a lunular white spot between 2 and 3. The marginal border of hind wing strongly suffused with olive-green towards anal angle.

Exp. 150 mm.

Athis hegemon, Koll.

Castnia hegemon, Koll. Ann. Wien. Mus. vol. i. p. 217, pl. xiii. fig. 2 (1839).

The hind wing of this species shows considerable variation with regard to amount of black. The series now consists of 13 ♂ ♂ and 4 ♀ ♀.

Elina icarus penelope, Schauf.

Castnia penelope, Schauf, Nunquam Ptiosus, p. 9, pl. i. (1870).

Fassl has sent from Santarem two more males of this form.

Sympalamides phalaris lombardi, Houlb.

Sympalamides minon, var. *lombardi*, Houlb. Etud. Lépid. Camp. xv. p. 383, f. 130 *bis* (1918).

A series of 6 ♂ ♂ from S. Catharina, Brazil.

Schaefferia amycus, Cram.

Papilio amycus, Cram. Pap. Exot. iii. p. 60, pl. ccxxvii. f. D, E (1779).

This species appears to be very rare and at the same time very variable. Houlbert considers *amycus* to be restricted to Guiana, while Rothschild is of opinion that its range extends to Rio de Janeiro. I think that at present there is not sufficient material to be able to say, for, as far as I know, there are only three authentic Guiana specimens known, all males—two in the Oberthür Collection from Surinam and one here from French Guiana.

One thing is certain, and that is that these three males have a much greater development of red on the hind wing above than in Brazilian specimens; on the other hand, the female from Rio de Janeiro has a much greater development of red than in the male, and consequently closely resembles the Guiana male in the coloration of the hind wing.

Madame Fournier has a female from the Island of Tobago. In this specimen the three upper spots of the postdiscal band of hind wing above are white bordered with red. It is possible that this may be another race, but, as its male is unknown and the Guiana female also, I prefer for the moment to regard it as a female of *amycus*.

Schaefferia canis, sp. n.

Upperside.—Fore wing deep shining olive-green, outer margin narrowly bordered with purplish grey, fringes of same colour; an oblique white band from middle of costa

to vein 2 near termen; five subapical white spots, of which the three upper are elongated. Hind wing black; a marginal row of dull vinous-red patches; an irregular discal milky-white band, produced towards outer margin between veins 2 and 5, and enclosing a black spot between 4 and 5; fringes dark grey at apex and anal angle, white in between.

Underside.—Fore wing black, a basal white patch; costa and outer margin narrowly reddish brown, apex widely so; white band and spots as above. Hind wing reddish brown, basal third white; four discal white spots, of which the two upper are nearer the base.

Thorax above of same colour as fore wing, below white; abdomen above deep olive-green ringed with white, anal tuft orange; abdomen below white, anal segment orange.

Exp. 62 mm.

Perené, Peru. 1 ♀.

This remarkable little species appears to be closely allied to *S. subcærulea*, Rothsch., but in that species the abdomen is entirely black and the hind wing wants the marginal red patches.

The wonderful reflections—rose, green, blue, according to the angle in which it is seen—on the milky-white band of the hind wing make this a conspicuous species among the Castniinæ.

This milky-white band bears a most curious resemblance to a dog's head, and is very similar to the design of the fore wing of the American Pierid genus *Meganostoma*.

Aciloa palatinus pallida, Lathy.

Aciloa palatinus pallida, Lathy, Ann. & Mag. Nat. Hist. ser. 9, vol. ix. p. 80 (Jan. 1922).

Since describing this form, Mr. Dick has sent six more males and the female, of which I give a description.

Differs from the typical *palatinus* in the band of the hind wing being much narrower and white instead of yellow.

Aciloa rutila, Feld.

Castnia rutila, Feld. Reise Novara, Lépid. iv. pl. 79. f. 1 (1874).

One male from Maroni, French Guiana.

Imara satrapes catharina, Preiss.

Castnia satrapes, var. *catharina*, Preiss, Neue & Selt. Art. Cast. p. 7, pl. i. fig. 1, pl. iv. fig. 3 (1899).

A male and female from Rio Grande do Sul, that belong to the form described by Strand under the name of *rufimaculata*.

Spilopastes galinthias, Hopff.

Castnia galinthias, Hopff. Neue od. wen. bek. Schmett. p. 7, pl. iv. f. 4 (1856).

Two males of this rare species.

Hæmonides cronis urichi, subsp. n.

Very near to *Cronis cronis,* Cram., but much larger. The subapical white spots and marginal white spots larger; black border on inner margin wider.

Marginal black border of hind wing more pronounced.

Exp. 92 mm.

1 ♂, Trinidad.

This is another of the interesting captures of that indefatigable collector, Mr. R. Dick.

Herrichia acræoides diffusa, subsp. n.

Differs from the typical form in its larger size; much paler fore wings, the internervular black rays being almost absent; the subapical band ill-defined and produced nearly to termen.

Exp. 80 mm.

1 ♂, Matto Grosso, Brazil.

XXIV.—*New Rhopalocera from Kei, Tenimber, and New Guinea.* By the Rev. G. Hulstaert, M.S.C.

Where, in the following pages, a specimen is mentioned as being "in coll. Arnh.," its significance is that that specimen belongs to the collection of the Missionaries of the Sacred Heart, at Arnhem (Holland), some specimens of which have kindly been sent to me for examination by the Rev. A. Adriaanse, M.S.C. The other types are in our collection at Heverlee.

Papilionidæ.

Papilio agamemnon argynnus, Druce, ab. *ignaurea,* nov.

On both wings the markings are not green, but golden copper, only the basal stripe and basal outline of second stripe of fore wing and the basal stripe of hind wing remaining green, the costal markings of other bands of hind

wing white. The underside similar, but costal spot of second (subbasal) band of hind wing green.

Of this handsome aberration a ♂ was secured by Rev. P. van der Raad, M.S.C., at Satheen (Little Kei), 17.1.1921. It does not seem to be an artificial one, obtained by killing the insect by poison (it appears to have been killed with the fingers), because the colour of thorax and of some markings of the wings are typically green, as are also all the other specimens captured by the same collector at the same locality and at the same time.

Pieridæ.

Terias candida talboti, subsp. n.

♂. *Above.*—Fore wing: black of base and costal border narrow; outer black border as broad as in *T. c. dindymene*, Fruhst., except in its apical part, thus narrowing more regularly. Hind wing: black border as broad as on fore wing, broader than in *dindymene,* almost of equal breadth up to vein 1*b*; anal black border dusty, reaching base of wing and extending to beyond vein 1*b*.

Below.—Costa entirely yellow; black border similar to above, on fore wing somewhat narrower, on hind wing narrowing towards tornus and ending there; no anal border.

♀. *Above.*—White. Fore wing: base dusted with greyish brown; black border extending to point of separation of veins 6–7, then narrowing, more or less sinuous in the interspaces, 5 (in the smallest specimen) or 7 (in the largest) mm. broad on vein 3. Hind-wing border a little broadened towards tornus, anal area and base closely dusted with blackish brown-grey, the irroration extending to vein 3 and occupying the basal half of cell.

Below.—Green-yellow, border brownish, similar to above, but on hind wing narrowing regularly below vein 4 towards tornus.

Expanse.—♂ 35 mm., ♀ 32–44 mm.

1 ♂, Watuar (Great Kei I.), 10.4.1909 (type), in coll. Arnhem; 2 ♀, Watuar, 23.3.1909, Namār (Little Kei I.), 15.1.1909 (allotype); 1 ♀, Watuar, 1.4.1909, in coll. Arnh.

Terias blanda dosithea, subsp. n.

♂. *Above.*—Resembling *T. b. silhetana*, Wall. Black border not extending to point of separation of veins 7 and 8,

then narrowing to vein 1 and excised between this vein and vein 2, then broader again ; the excision not so pronounced as in many of the *blanda* races, similar to *silhetana*, the black border being 2 mm. broad on vein 4 and 1½ above inner margin and of the same breadth as in other races between them.

Hind wing : black border narrow, dentate on veins.

Below.—With the ordinary *blanda* markings.

Genitalia.—Compared with *T. b. vallivolans*, Butl., the extremity of claspers has its proximal tooth somewhat less produced, its dorsal edge a little more sinuous ; hook of harpes narrower, acute; distal dorsal hook placed more inwardly and more curved; outer and inner proximal hooks absent (?) ; extremity of uncus deeper excised, its basal third more produced.

Expanse.—35 mm.

1 ♂, Olilit (Jamdena I.), Tenimber (*Rev. D. van Roessel, M.S.C.*).

Whilst many races of *T. blanda* are hardly distinguishable from *T. hecabe*, this new race is very distinct, even at a glance, from the Tenimber specimens of *hecabe*, by its distal black border being narrower and thus less deeply excised above tornus.

Danaidæ.

Euplœa confusa marinda, Hulst., ♀.

Euplœa confusa marinda, Hulst., ♂, Ann. & Mag. Nat. Hist. (9) xi. p. 624 (1923).

♀. *Above.*—Fore wing yellowish red-brown ; basal part of costa blackish. Discal pale area much larger than in ♂, entirely white, reaching base of wing below cell, entering into cell but not extending to its middle, reaching origin of vein 3, then rounded-narrowed to vein 2, where it remains 4 mm. from termen, and below which it is still a little nearer margin ; extending beneath vein 1 on a rather large extent and leaving only a very narrow suffusion along inner margin. Hind wing similar to fore wing, but a little paler beyond cell, the anal area still paler, somewhat greyish white; base of cell darker; inner area to vein 3 still more so, blackish brown.

Below.—Much darker than above, similar to upperside of ♂, especially in basal half of both wings; postmedial half of fore wing and costal, terminal, and anal areas of

hind wing paler, fuscous brown. Fore wing: discal pale area similar to above, but ochreous yellow in cell and just below cell, extending to above origin of vein 3, its outer edge diffusely limited, nearer termen, reaching tornus; inner margin entirely whitish. Hind wing with four distinct blue discal spots in cell and between veins 6 and 3.

1 ♀, Merauke (Southern Dutch New Guinea), in coll. Arnh.

Danaida juventa kolleri, Hulst.

Ann. & Mag. Nat. Hist. (9) xi. p. 181 (1923).

1 ♂, 1 ♀, Merauke, in coll. Arnhem, which confirm my opinion about the distinction of this race from the other New Guinean forms.

Tellervo assarica adriaansei, subsp. n.

♂. Fore wing: basal streak and subcostal spot absent: cell-spot small, somewhat triangular, but its outer and inner edges rounded. Subapical spots larger than in *T. a. waigeuensis*, J. & T.* (=*fallax*, Fruhst., nec Staud.*), rounded distally, except the intermedian one; that above vein 5 smallest, its upper edge rounded; inner edge of the two upper spots straight, placed on one line; lower one almost double as large as the intermedian, remaining 3 mm. from termen, its inner edge more distal. Hind wing: band rather broad at middle, shorter than in *a. assarica*, Cram., rather strongly indented at veins 1*b*, 2, 3, 6, slighter at 4, remaining 5 mm. from termen above vein 6, then nearer it, the terminal black becoming broader again below vein 4 towards tornus, 7 mm. at vein 2; veins 3 and 2 white on equal extent; anal border entirely black, vein 1 slightly streaked with black; basal black extending downwards to near base of vein 2.

Underside.—Fore wing: basal white spot in cell and subcostal spot present; cell-spot not rounded, with irregular edges; the two upper subapical spots with more irregular outer edge; white subterminal dots above veins 1, 2, 4, 5, 6. Hind wing: white band similar to above, but with black costal invagination on discocellulars and minute discocellular black stripe at vein 5. A series of six subterminal dots, those of cellules 3, 6, 7 more prominent than the others.

Expanse.—42 mm.

1 ♂, Merauke, in coll. Arnh.

* *Cfr.* Bull. Hill Mus. i. p. 344 (1922).

Satyridæ.

Mycalesis missionarii, sp. n.

♀. *Above.*—Red-brown, paler than *baszochi*, Guér., and *durga*, Sm. Fore wing: distal half of costal area up to vein 5 and terminal area pale faint greyish; ocelli above veins 2, 4, 5, and a red point above vein 3, the former reddish with black centre, white pupil, and blackish-grey outline, the one above vein 4 without white pupil and very small, the anal one large, nearly as in *durga jobina*, Fruhst., almost twice as large as the apical; a faint waved terminal line; cilia greyish. Hind wing: without any greyish suffusion distally, except the narrow space between termen and black waved terminal line: a series of four ocelli between veins 1*b* and 5, coloured like those on fore wing, the two medial ones somewhat oval, larger than the others, nearly as large as the anal one of fore wing; at each extremity of the row a minute reddish-brown point with faint dark outline; cilia greyish; the ocelli are almost of the same colour as the rest of wing, but mixed with brown and orange.

Below.—Brownish grey, somewhat as in the figure of *durga exheredata*, Fruhst. in Seitz, ix. pl. 93*a*, but the proximal half more tinged with yellowish, the terminal half reddish brown, somewhat browner than above. Fore wing: inner area also reddish brown; a faint brownish curved antemedial line in cell and below base of vein 2; a reddish-brown, slightly waved postmedial line with a yellowish-grey suffusion beyond it, the band thus formed almost as broad as in the figure of *mamerta annamitica*, Fruhst. in Seitz, ix. pl. 92*b* (but the colour much more greyish!), and at equal distance from cell and from ocelli, which are pale ochreous with black white-pointed centre and greyish and yellowish-grey circles, smaller than above, the two medial ones well developed, almost as large as the upper one; apical part of costa and terminal area brownish grey, proximal edge of the latter waved, as is also the red-brown terminal line; termen dark red-brown. Hind wing: colour, medial band and ocelli similar to fore wing; anal area tinged with yellowish, a reddish antemedial line, faint below cell, sinuous on vein 8 and subcostal, lower discocellular striped with red-brown; row of ocelli complete, apical one oval, with large black centre, those between veins 2 and 4 largest, as large as above, terminal area and line as on fore wing.

Thorax and abdomen above coloured like wings, below whitish.

Expanse.—48 mm.

2 ♀, Merauke, 1912 and 1922 (*Rev P. Vertenten, M.S.C.*).

As there is no ♂, it is impossible to place this species exactly. It appears, however, to be allied to *durga*, Sm., *tagala*, Feld., *nerida*, Sm., and possibly it may be only a form of the latter.

I am indebted to Mr. G. Talbot for kindly giving me his opinion about this species. He also thinks it may possibly be a distinct species.

Nymphalidæ.

Precis orithya marcella, subsp. n.

Allied to *novæ-guineæ*, Hag., and *mevaria*, Fruhst.

♂. *Above.*—Fore wing: white markings well developed, subapical band broad, 4 mm. on vein 6, 3 mm. on vein 4, nearly touching subapical ferruginous, which extends to vein 7; terminal whitish line obsolete at apex, at middle, and towards tornus; admarginal line hardly traceable, subterminal white between veins 4 and 2 well developed, confluent with subterminal line at vein 3; anal ocellus not prominent, but with developed purple centre and bluish outer circle. Hind wing similar to that of *mevaria*, anal area and cell black except a small area from before origin of vein 7 till vein 5; middle discocellular not streaked with black; apical ocellus completely black with only a very faint trace of purple centre; anal one somewhat oval with sharply limited circles and large purple centre; only two subterminal white lines, the ocelli entirely surrounded by blue.

Below.—Compared with *palea*, Fruhst.: darker; markings more sharply limited. Fore wing: ocelli with purple centre; traces of small ocelli also in interspaces 5, 7, 8, and 9; orange surrounding of apical ocellus separated from vein 4, that of anal one present only basally. Hind wing yellowish; markings of basal area paler, less distinct than in *palea*; medial band white, its outer edge hardly sinuous, almost quite straight; all ocelli well developed, with purple centre, those in cellules 7, 5, 4 larger than in *palea*, those in cellules 6 and 3 smaller, the ferruginous surrounding very prominent throughout; black admarginal line well distinct, marginal pale area white, prominent.

1 ♂, Merauke (New Guinea), in coll. Arnh.

XXV.—*Some Nematodes of the Genus* Cucullanus *from Fishes of the Nile.* By H. A. Baylis, M.A., D.Sc.

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The forms mentioned in this paper occurred among material kindly submitted to the writer for examination by Dr. W. N. F. Woodland, being part of the collection of the Wellcome Bureau of Scientific Research.

The characters and systematic position of the genus *Cucullanus*, Müller, 1777 (= *Dacnitis*, Dujardin, 1845), and of the family Cucullanidæ, sens. strict., have been discussed in a recent paper *. The genus contains a considerable number of very imperfectly defined species, and, indeed, it is extremely difficult to determine forms belonging to this group, since they adhere very closely to a typical pattern and appear to have very few specific characters apart from measurements. Moreover, a large proportion of the older descriptions are so meagre that the occurrence of a species in the same host is sometimes almost the only indication of its identity with a described form. A useful list of species has been given recently by Barreto †. Those hitherto described from marine hosts greatly outnumber those from freshwater fishes. The two forms here described as new have been compared with the original descriptions of all the species known to the writer that fall into the latter category, but apparently cannot be identified with any of them.

1. *Cucullanus fossor* (Jägerskiöld, 1902).

Syn. *Dichelyne fossor*, Jägerskiöld, 1902, Zool. Anz. p. 564; id., 1909, Res. Swed. Zool. Exp. Egypt and White Nile, 1901, no. 25, p. 46, pl. iii. figs. 1–9, pl. iv. figs. 1–6.

This species was originally recorded by Jägerskiöld from *Lates niloticus* at Omdurman, and was described as the type of a new genus—*Dichelyne*—considered to have close affinities with *Physaloptera*. Seurat ‡ has referred it to the family "Acuariidæ." A study of the present material and of Jägerskiöld's excellent description and figures shows that the species is a typical *Cucullanus* (= *Dacnitis*), though of exceptionally stout build, and that there is no justification for the retention of the genus *Dichelyne*.

* 'Parasitology,' xv. 1, pp. 28–33.
† Mem. Inst. Oswaldo Cruz, xiv. 1 (1922).
‡ Compt. Rend. Soc. Biol., Paris, lxxviii. p. 22.

The hosts of the present material were *Lates niloticus* and *Bagrus bayad*. The former fish is a Serranid, the latter a Silurid, and there appears to be no close relationship between these families of fishes.

Locality: Khartoum.

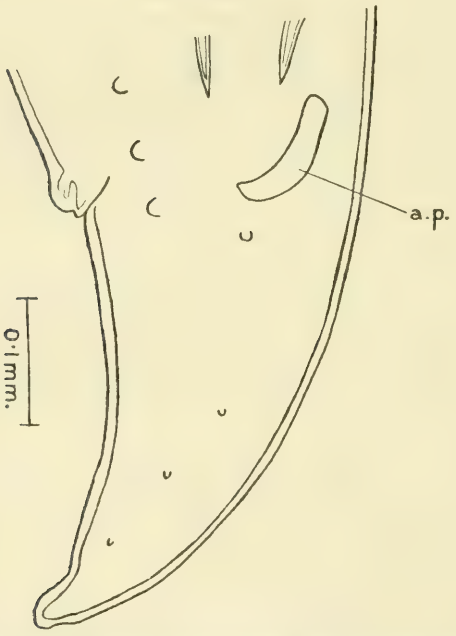
2. *Cucullanus barbi*, sp. n. (Fig. 1.)

Host: *Barbus bynni*.

Locality: Khartoum.

Length: largest male about 15·5 mm.; largest female

Fig. 1.



Cucullanus barbi. Caudal end of male; lateral view, showing the arrangement of the papillæ (the three anterior pairs not shown).

a.p., accessory piece.

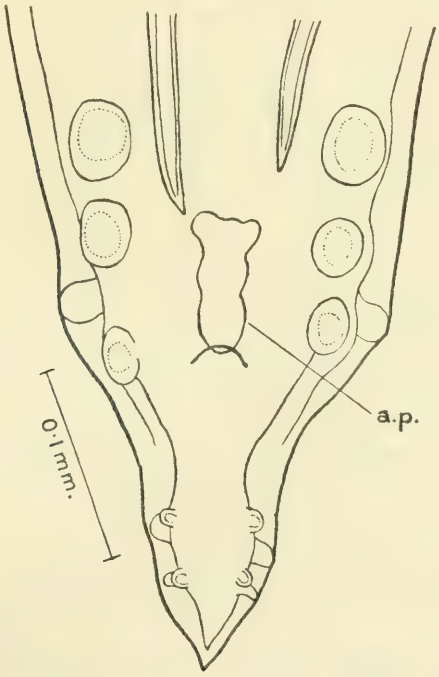
about 19 mm. Thickness 0·51 mm. and 0·66 mm. respectively (somewhat flattened by pressure of cover-glass). Cuticular striations fine (about 2 μ apart). No additional "serration." No dorsal head-tubercle. Distance from anterior extremity to posterior end of œsophagus 1·7 to 1·9 mm.; to end of anterior division of œsophagus (the lining of which has three longitudinal strip-like cuticular thickenings) 0·58–0·64 mm. Cervical papillæ at 0·82 mm. in male, 1·02 mm.

in female, from anterior end. Nerve-ring at 0·5–0·58 mm., excretory pore at 0·67 mm. (male)–0·85 mm. (female) from the same point.

Tail of male about 0·37 mm. long. Length of spicules 1·3 mm., of accessory piece about 0·1 mm. Caudal papillæ ten pairs. One of the four papillæ commonly present in the group on either side near the tip of the tail is apparently absent. All the papillæ, except the three most anterior pairs, are very small.

Tail of female 0·34 mm. long. Vulva at 7·5 mm. from posterior end. Ova measure 0·075 × 0·05 mm.

Fig. 2.



Cucullanus clarotis. Caudal end of male; ventral view, showing the arrangement of the papillæ (the three anterior pairs not shown).

a.p., accessory piece.

3. *Cucullanus clarotis*, sp. n. (Fig. 2.)

Hosts: *Clarotes laticeps*, *Synodontis schaal* (males only from the former host, females only from the latter, but in all probability all belong to the same species).

Locality: Khartoum.

Length: male 7–10 mm.; female up to 11 mm. Thickness 0·4–0·6 mm. (somewhat flattened by pressure of cover-glass). Cuticular striations very fine, irregular. No additional "serration." No dorsal head-tubercle. Distance from anterior extremity to posterior end of œsophagus 0·85–1·1 mm.; from the same point to end of anterior division of œsophagus (the lining of which has three strip-like thickenings) 0·38–0·46 mm.; to cervical papillæ 0·6–0·64 mm.; to nerve-ring 0·35–0·38 mm.; to excretory pore 0·5 mm.

Tail of male 0·13–0·15 mm. long. Length of spicules 0·8 mm, of accessory piece about 0·08 mm. Caudal papillæ eleven pairs, those of the adanal group large and prominent. Four small pairs in the group near the extremity, of which two are subventral and two lateral.

Tail of female 0·37 mm. long, with a pair of caudal papillæ at 0·225 mm. from the tip. Vulva at 5 mm. from the posterior end. Ova measure 0·0825 × 0·0625 mm.

Co-types of the two new species will be deposited in the British Museum (Natural History) and at the Wellcome Bureau of Scientific Research.

XXVI.—*On the Biology of* Lacerta serpa, *Raf.* By Dr. St. J. Bolkay, Assistant Keeper at the Bosnian-Hercegovinian Government Museum in Sarajevo.

It is a well-known fact that the so-called "Massive Lizards," like *Lacerta simonyi*, Stdchr., *L. galloti*, D. B., *L. dugesi*, M.-Edw., *L. ocellata*, Daud., and *L. major*, Blgr., feed themselves not only on living animals, but also eat various fruit when they are fully-grown.

According to Werner*, the big lizards of the Canary Islands like tomatoes very much, and, using it as bait, one can easily catch them, as Steindachner has stated; others eat cherries, grapes, and such-like fruit. Hartwig relates that *Lacerta dugesi* of Madeira causes as much damage in the vineyards as rats. The Spanish Eyed-Lizard (*Lacerta ocellata*, Daud.) and the Great Southern Green Lizard (*Lacerta major*, Blgr.) are very fond of cherries and fruit of the same kind, and consume great quantities of cherries in an unchewed condition.

* Werner in Brehm's "Tierleben, Kriechtiere und Lurche," 2, iv. Aufl. 1913, p. 158.

Knowing the above facts, I was very much surprised to find our *Lacerta serpa*, Raf., to be a partial vegetarian.

On the 13th September, 1920, I was collecting close to the city of Dubrovnik (Ragusa), in Dalmatia, at the so-called Ploce-gate, on a rather steep slope declining towards the sea. One part of this slope was overgrown with *Solanum nigrum*, L., which weed carried at that period its ripe dark blue berries. Upon this ground I found a great many *Lacerta serpa*, very old and full-grown specimens, mixed up with quite young ones. All the full-grown specimens were fat and clumsy—that is to say, all were evidently replete with some food.

As I was catching the animals upon this spot, and was pressing the wriggling strong lizards, as a consequence of the pressure, most of the specimens vomited and gave back the chewed berries of *Solanum nigrum*. They were literally stuffed with those berries! In the fæces of many specimens I have seen the seeds of *Solanum nigrum*.

Nowhere in the whole neighbourhood of Dubrovnik, where this beautiful stately lizard occurs, was I able to observe this habit of *L. serpa* in want of the named plant.

We may name this habit as "local vegetarianism," because the lizards feed themselves only occasionally on these berries and only in such places where *Solanum nigrum* occurs.

I have several times had occasion to observe on small Lacertids like *Algiroides nigropunctatus*, D. B., *Lacerta taurica fiumana*, Wern., and *L. taurica fiumana*, Wern., var. *méhelyi*, By., kept in terrarium, that these lizards are in some degree also phytophagous. I fed my animals with a mixed insect-food, which I procured with the aid of a linen-net from shrubs in bloom. The contents of the net, consisting of various insects, branchlets of shrubs, and small white flowers of the shrubs in bloom, I poured into the terrarium. I have seen several times that the above-named lizards took the white petals of the flowers and swallowed them.

It will not be without interest to mention here that all the specimens of *Lacerta serpa* living on a wall under the slaughtering-bench at Dubrovnik are rusty brown above. The wall, on which the lizards are constantly hunting, is in its whole extent rusty brown, the blood from the slaughtering-bench flowing permanently through several holes upon it.

All the *L. serpa* specimens, living on other places around Dubrovnik, are light-grey coloured, the walls being built

chiefly from limestone. It is also a well-known fact that *L. serpa* is one of the most variable species.

This observation is nevertheless interesting, demonstrating the fact that a living organism is able to change its colour in a relatively short time, to correspond to a change in its environment. At the same time, we may see that the changed condition of the environment produces its first effect upon the integument and on the chromatophores respectively.

On the strength of such observances we may conclude that a living organism in the first line is nothing else than the automatic product of the natural surroundings *.

XXVII.—*Descriptions and Records of Bees.*—XCVIII.

By T. D. A. Cockerell, University of Colorado.

Osmia (*Cephalosmia*) *armaticeps*, Cresson.

♀.—Reared from pupal cells in a tunnel in heartwood of *Juniperus utahensis*, Minidoka National Forest, Utah (*A. B. Morse*), U.S. National Museum.

This is the first record of the nesting-habits of *Cephalosmia*.

Halictus cyclurus, Cockerell.

♀.—Tambourine Mountain, Queensland, at flowers of *Helichrysum bracteatum*, Oct. 27, 1912 (*Hacker*).

Halictus rufibasis, sp. n.

♀.—Length about 5 mm.

Robust, with very broad abdomen; head and thorax shining black, with very scanty hair, but the short, very thin hair on head and thorax above is dark brown; flagellum very obscurely brownish beneath; clypeus sparsely punctured; front very minutely roughened and punctured; laterad of each antenna is a dull microscopically lineolate patch, but between this and the eye the surface is polished; mesothorax very minutely transversely lineolate and sparsely and very weakly punctured; area of metathorax with about sixteen sharp plicæ; posterior truncation not sharply defined; tegulæ

* Bolkay, St. J., "Nekoliko primjedbi o *Lacerta veithi*, By." ("Some Notes on *Lacerta veithi*, By."). Glasnik zem. muzeja u Bosni i Hercegovini, xxxii. 1920, p. 226.

very dark brown, not punctured. Wings dilute brownish, with very large dull red stigma; outer recurrent and basal nervures weak. Legs piceous, the hind tibiæ and tarsi with stiff black bristles, strongly branched on anterior side of tibiæ; middle femora basally beneath with a brush of stiff pale reddish hair. Abdomen highly polished; first segment clear ferruginous, narrowly dusky at apex; second segment broadly clear red basally, but apical region and extending obliquely up sides very dark brown; rest of abdomen black, except that third segment is red at extreme base; venter with dark hairs.

National Park, Queensland, Dec. 1919 (*H. Hacker*). Queensland Museum.

Halictus hemichalceus, sp. n.

♀.—Length about 5·5 mm.

Robust; head broad, black, clypeus and supraclypeal region slightly purplish, eyes green in front; mandibles broadly bright ferruginous in middle; labrum dark red; hair of head and thorax thin, distinctly brown on mesothorax; flagellum ferruginous beneath except at base; clypeus sparsely punctured; front dull, with excessively close minute punctures; mesothorax and scutellum dark brassy green, the mesothorax dull, closely and distinctly punctured, scutellum shining on disc; area of metathorax large, with fine strongly wrinkled rugæ; metathorax and pleura black; tegulæ dark red. Wings dilute brownish; stigma large, pale yellowish brown, outer recurrent and intercubitus pallid. Legs mainly black, with pale hair, but anterior tibiæ in front, and especially the knees, bright ferruginous; hind spur with a single large curved obtuse tooth. Abdomen dull ferruginous, the first segment with a large black discal shade; venter with white hair, not curled.

Brisbane, Queensland, Sept. 1914 (*H. Hacker*). Queensland Museum.

Halictus basilucens, sp. n.

♀.—Length hardly 5 mm.

Head and thorax black, dullish, with scanty pale hair; mandibles red in middle; flagellum dusky red beneath, brighter toward apex; clypeus shining, very sparsely punctured; front with microscopical raised lines; mesothorax dull, minutely and closely punctured; area of metathorax with fine anastomosing rugæ; posterior truncation not sharply defined; tegulæ red. Wings dusky hyaline; stigma dark

red, large but rather short ; first recurrent nervure meeting second intercubitus ; outer recurrent and intercubitus weakened. Legs black, with pale hair, knees and small joints of tarsi reddish ; hind spur with a single large spine. Abdomen shining, but minutely punctured, bright castaneous, the first segment black, polished, except the broad apical margin ; venter with white hair, not curled.

Bribie Island, Queensland, Aug. 29, 1918, 2 ♀ (*H. Hacker*). Queensland Museum.

The following key separates the above species of *Halictus* from each other and from others having a mainly or wholly red abdomen :—

	Mesothorax brassy, dull	*hemichalceus*, Ckll.
	Mesothorax pure black	1.
1.	First abdominal segment red	2.
	First abdominal segment mainly dark or black.	4.
2.	Mesothorax with conspicuous strong punctures.	*ewarti*, Ckll.
	Mesothorax without distinct punctures under a lens	3.
3.	Abdomen red	*clarigaster*, Ckll.
	Abdomen beyond base of third segment black.	*rufibasis*, Ckll.
4.	Area of metathorax larger, without distinct rugæ	*cyclurus*, Ckll.
	Area of metathorax with distinct rugæ	*basilucens*, Ckll.

Trigona, Jurine.

The species of this genus known from the Malay region are now so numerous that the accurate identification of those briefly described by Smith is not always easy. I accordingly made the following table from the specimens in the Wilson Saunders collection at Oxford :—

	Entirely testaceous or ferruginous, with hyaline wings: small species	1.
	Ferruginous; wings fuliginous, hyaline beyond level of end of stigma; front legs red, middle and hind tibiæ and tarsi black; abdomen not banded	*atripes*, Sm.
	Colours red and black: comparatively large species	2.
	Black species, at most with a little pale colour.	3.
1.	Facial quadrangle broader than long; flagellum black	*atricornis*, Sm.
	Facial quadrangle longer than broad; flagellum not so dark	"*testacea*, Klug."
2.	Head black; basal nervure meeting nervulus (a little on basad side); mesothorax red; abdomen shining black, extreme base pale	*thoracica*, Sm.
	Head red; basal nervure decidedly basad of	

nervulus; wings clear hyaline, suffused with orange toward base (dusky in *thoracica*); first three abdominal segments fulvous, with broad black margin ..... *fimbriata*, Sm.

3. First abdominal segment very pale testaceous, with a large brown spot on each side; wings dusky, not bicoloured; basal nervure going basad of nervulus; abdomen narrow; looks like a mimic of some fly ..... *ventralis*, Sm.
First abdominal segment not so coloured .... 4.

4. Wings bicoloured, basal half fuliginous, apex hyaline; scape ferruginous ..... 5.
Wings not bicoloured ..... 6.

5. Smaller (anterior wing 6·2 mm.); scape black above; tegula black; mesothorax polished black; fuliginous of wings not so dark .... *collina*, Sm.
Larger; flagellum entirely pale ferruginous; tegulæ pale ferruginous; clypeus pale reddish; abdomen rather broad and short ..... *apicalis*, Sm.

6. Small, anterior wing about 4·3 mm.; face with pale pile; scape clear red; mesothorax shining black; tegulæ dark; stigma dusky, with broad fuscous margin; abdomen reddish black, parallel-sided. (Aru.) ..... *læviceps*, Sm.
Considerably larger ..... 7.

7. Mesothorax and front entirely dull; scape black, testaceous (strongly contrasting) at extreme base; stigma dull ferruginous, without dark margin; hind tibiæ racket-shaped; abdomen narrow, first segment with a narrow testaceous margin. (Mt. Ophir.)..... *nitidiventris*, Sm.
Mesothorax shining ..... 8.

8. Larger, length about 7·5 mm., robust, head very broad; abdomen intense black; scape black, red at extreme base; mandibles black, faintly reddish toward apex; face hoary, with pale pubescence; stigma slender, dusky reddish; scutellum covered with black hair. (Wallace's label, "Sar.") ..... *canifrons*, Sm.
Smaller; mandibles dark red except basally; face and front polished, not hoary with pubescence, but naked; scape black, pale at extreme base; stigma dark fuscous; basal nervure exactly meeting nervulus. (Wallace's label, "N.") ..... *planifrons*, Sm.

At Cambridge University I found a series of *Trigona* from Borneo, described by Cameron, and made the following table:—

Entirely ferruginous, except dark hind tibiæ and middle and hind basitarsi, and linear black bands across abdomen; the middle tibiæ have abundant coarse black hair; large species; mandibles with two sharp black teeth on inner side ..... *flavistigma*, Cam.

Abdomen red; head black, with red clypeus; thorax red, with fulvous moss-like pubescence above; scape red, black apically, a red mark between antennæ; wings hyaline, slightly orange-tinted: rather large species. (Kuching.)	*lacteifasciata*, Cam.
Abdomen rather narrow, parallel-sided, first segment pale yellowish red, with a dark spot at each side, second red, with a median black band, widening posteriorly, third with about basal half on each side dark red; head entirely black; anterior wings 7 mm. long, hyaline, orange-tinted	*erythrogastra*, Cam.
Abdomen black or piceous	1.
1. Wings bicoloured, basal half fuliginous, apical hyaline; scape yellowish red, not black above, but flagellum dark, with underside yellowish ferruginous; tegulæ black; face with white pubescence. (Patalung, Malay Peninsula, *Skeat.*)	[true *collina*).
	"*collina*, Sm.?" (not
Wings not bicoloured	2.
2. Scape black, except at extreme base. (Kuching.)	*canifrons*, Sm.
Scape red; face and front with short thin pale hair; small tarsal joints red; wings dusky; mesothorax shining; small species	*testaceitarsis*, Cam.

Cœlioxys zonula, Smith.

I found this species, from Santarem, in the Wilson Saunders collection.

♀.—About 18 mm. long.

First three abdominal segments dark red; last dorsal segment much shorter than last ventral, with erect black hair on apical part; last ventral greatly produced, very slender, with long black hair on each side.

C. gigantea, Friese, from Pará, is at least very closely allied.

Ctenioschelus goryi, Romand (*latreillei*, Lep.).

Both sexes are in the Oxford collection. The female is very like *Thalestria smaragdina*, Sm., but has a more pronounced cloud at apex of wings. The first recurrent nervure meets the second intercubitus, in *Thalestria* it goes a little beyond it. There is a broad longitudinal band of black hair on mesothorax; in *Thalestria* there is a broad band of black hair across the thorax in front.

As Ducke indicates, the genus *Ctenioschelus* is distinct from *Acanthopus*.

Mesotrichia insularis (Smith).

In the Oxford collection are two males, both with Wallace's label "SAR." (Sarawak). One has expanse 49 mm., the other only about 41. They agree in having only two submarginal cells; first recurrent nervure meeting intercubitus.

Also at Oxford is a pale ♂ *Mesotrichia* from Ceram, without a name. It has exactly the appearance of *M. ceramensis*, Ckll., and no doubt is that species.

Xylocopa ignita, Smith.

Jericho (*B. Lowne*), in Oxford collection, with a note—"agrees with this except its wings are more richly purple." Is there a Syrian subspecies?

Anthophora cærulea, Friese.

The genuine *cærulea* has blue bands on the abdomen. The British Museum has a good series from Entebbe, Uganda, and Nyassaland.

Apis indica, Fabricius.

At Oxford I found in the old Hope Collection a specimen of *Apis socialis*, Latr., labelled in Latreille's handwriting. It has a red scutellum. The abdomen is missing.

Alcidamea producta (Cresson).

In 1864 Cresson described three supposedly new bees—*Heriades simplex* ♀, from Connecticut (*Norton*), *Alcidamea pilosifrons* ♂, from the same locality and collector, and *A. producta* ♂, from Virginia. In 1887 he regarded *H. simplex* and *A. producta* as the sexes of one species, and *pilosifrons* as a variety of the same. As the name *simplex* has priority of place in the original publication, I have called the species *Alcidamea simplex*. Recently some doubts arose, and I am indebted to Mr. E. T. Cresson, Jun., for kindly reporting on certain features of the types. It now appears certain that *A. simplex* and *A. pilosifrons* are the sexes of a species which is distinct from *A. producta*. In *A. simplex* the first recurrent nervure ends at a somewhat greater distance from the first intercubitus, and the tubercle on the second ventral segment of the male abdomen is low and broad, instead of being high and produced as in *producta*.

Specimens from Colorado (Florissant and Boulder), and

those collected by Mr. P. Rau at St. Louis, Missouri, are all *A. producta*.

Megachile gathela, Cameron.

According to Meade-Waldo, this Indian species (described from Deesa) is identical with *M. nana*, Bingham, from Tenasserim. On examining the specimens in the British Museum, I found this to be an error. Both are true *Megachile*, without pulvilli, but *M. nana* has the ventral scopa all white; the clypeus very densely punctured, with apical margin broadly smooth; supraclypeal area shining, but punctured.

In *M. gathela* the scopa has black hair on the last segment; the clypeus is shining, with an inwardly directed brush of white hair on each side.

In a series of *Megachile* collected by Col. Nurse at Deesa, and supposed to be *M. cœlioxysides*, Bingham, I find this *M. gathela*, and also *M. katinka*, Nurse, with the ventral scopa ferruginous except at base. I also find *M. gathela* from Pusa, Bengal, July 1907 (Fletcher, 188), and Adderley, Nilgiris, 3000 ft., April 26, 1915 (*Dutt*; Fletcher, 191).

Bingham's short and unsatisfactory description of *M. cœlioxysides* may be applicable to *gathela*, and has ten years' priority, but Cresson much earlier called a Mexican species *M. cœlioxoides*.

M. katinka was considered by Meade-Waldo to be *M. hera*, Bingham, and this seems to be correct.

Megachile perfervida, Cockerell.

Hongkong.

The type, in the British Museum, is very like *M. ardens*, Sm., superficially, but *ardens* has black hair on face and front and transverse keel along top of clypeus, while *perfervida* has a broad transverse clypeus, with no keel, and face and front with fulvous hair, though there is black hair in the region of the ocelli.

Heriades striolata (Cameron).

Megachile striolata, Cam., in British Museum, is about 5·5 mm. long, with white abdominal bands and scopa. It has pulvilli, and is a *Heriades*. The basal nervure meets the nervulus.

Osmia cathena (Cameron).

Megachile cathena, Cam. (Brit. Mus.), is about 5·5 mm.

long, more robust than the last; pulvilli present; mesothorax densely punctured; tegulæ reddened; ventral scopa white.

Osmia indostana (Cameron).

Megachile indostana, Cam. (Brit. Mus.), ♂. Pulvilli present; tegulæ ferruginous; stigma and nervures pale ferruginous; wings clear. By colour of stigma and other characters cannot be the male of *O. cathena*.

Megachile punjaubensis, Cam., ♂ ♀, has exactly the aspect of *O. indostana*, but has no pulvilli, and is a *Megachile*. It is about 6·5 mm. long, scopa white.

Osmia suavida (Cameron).

Megachile suavida, Cam., ♂, in British Museum, has pulvilli and belongs to *Osmia*. Face with dense white hair; mandibles mainly pale; flagellum red; anterior and middle femora black, red at apex; hind legs all red. The female "*Megachile suavida*, Cam.," in the British Museum is a *Heriades*, as I have previously indicated.

The Cameronian species *Megachile ferozeporensis*, *subfusca*, *semireticulata*, *obtusata*, *cratodonta*, and *nicevillii* do actually belong to that genus. The following notes, made at the British Museum, will facilitate recognition:—

M. ferozeporensis.— ♀, about 9 mm. long; tegulæ ferruginous; abdomen with dull white bands; ventral scopa white, black on last segment.

M. subfusca.— ♂, about 10 mm. long; anterior tarsi simple, but with long white hair behind; hair of thorax above reddish ochraceous; keel of sixth abdominal segment strongly but widely emarginate, without denticulations.

M. semireticulata.— ♂, about 10·5 mm. long; eyes pale greenish, tinged with vermilion; face quite narrow; anterior tarsi simple, with short white hair behind; abdomen with broad, pale, ochreous-tinted hair-bands; transverse keel of sixth segment obtusely pointed, not at all emarginate, and beset with about ten sharp spines.

M. obtusata.— ♀, about 6·5 mm.; ventral scopa white. ♂, antennæ long and slender; face densely covered with white hair; anterior coxæ spined; anterior tarsi simple; sixth abdominal segment densely covered with white hair above, the keel broadly subemarginate in middle, with three sharp teeth on each side.

M. cratodonta.—♂, about 6·5 mm.; considerably larger than that sex of *obtusata*, and more robust; transverse keel of sixth segment broadly subemarginate in middle, crenulate on each side, with at least the innermost projection more or less spiniform.

M. nicevillii.—About size of *M. ulrica*, Nurse; pubescence dull white; eyes pea-green; head transverse, much broader than in *ulrica*, in which it is oblong; no white band in scutello-mesothoracic suture (there is one in *ulrica*). There is a ♀ *M. ulrica* from Karachi (*Comber*); it is about 7·3 mm. long, legs reddish, ventral scopa white.

The male of *M. punjaubensis*, Cam., apparently has the keel of sixth segment without spines, but emarginate; it is turned inward and hard to see well.

Megachile stirostoma, Cam., ♀, is about 14 mm. long, very black and rugose, but not a *Lithurgus*; abdomen of the parallel-sided type, with white scopa, dark fuscous at tip.

Megachile æola, Cameron.

Borneo.

Looks like *M. osea*, Cam., from the same locality, the types of both being males. In *æola* the anterior tarsi have a very long pale red fringe behind; not so *osea*, which is built rather like a ♀.

The following notes on African *Megachile*, made at the British Museum, will facilitate the identification of some difficult species:—

M. venusta, Sm., and *gratiosa*, Gerst., look alike. ♀ *gratiosa* has scopa black on last segment, *venusta* (Smith's type) has it red, but they are extremely similar.

M. harthula, Cam., looks as if it might be the male of *M. dorsata*, Sm.

M. marusa, Cam. (♀ type), is almost exactly *gratiosa* (scopa on last segment with black hair), but differs by scutellum shining between the punctures (scutellum dull in *gratiosa*).

M. sarna, Cam. (♂ type), has green eyes; anterior tarsi simple; keel of sixth abdominal segment emarginate; aspect of *gratiosa*.

Two species of *Heriades* and one of *Osmia* from Africa stand in the Museum bearing names of Cameron as species of *Megachile*. I refrain from discussing them, as they seem not to have been published.

Megachile femorata, Smith.

Smith's ♂ type has a large yellowish (suffused marginally with red) area on mandibles. Male *M. latimanus*, Say, in the Museum (New York, *H. Edwards*), has the same sort of mid-tarsi as *femorata*; the eyes are green, whereas in *femorata* they are suffused with pale red. The keel of sixth segment in *latimanus* has a deep **U**-shaped emargination; in *femorata* the emargination has the form of a very wide **V**, the sides of which are irregular.

XXVIII.—*A Preliminary Synopsis of the* Asteriidæ, *a Family of Sea-Stars**.

By W. K. Fisher, Director, Hopkins Marine Station, California.

The present synopsis is not a thoroughgoing revision of the Asteriidæ, available material being insufficient for such an attempt. It may more properly be considered an "account of stock." Of recent years the number of genera of Asteriidæ has greatly increased, owing to the discovery of new types and to a more careful scrutiny of the forms included within the traditional *Asterias*, *Coscinasterias*, and *Stichaster*. In certain sections of the Asteriidæ the genera present a confusing similarity of outward appearance, which recalls free crinoids.

The larger subheads of the synopsis occasionally associate genera not closely related, but this defect renders the key of greater practical value. Free use has been made of characters not heretofore employed, and certain genera, such as *Orthasterias* and *Coscinasterias*, have been dismembered. Discussion of numerous changes has been deferred owing to exigencies of space.

The key will be found of little value for immature stages. These cannot be identified in most instances without accompanying adult specimens, as young are usually too generalized to show their generic characters.

I have not been able to find satisfactory features by which

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to separate the Pedicellasteridæ from the Asteriidæ. Like most asteroid groups, they run together. *Pedicellaster*, *Hydrasterias*, *Anteliaster*, and *Peranaster* are extremes in which there is no adoral carina (*i. e.*, the adambulacral plates do not join interradially behind the mouth-plates as in the Asteriinæ). But *Tarsaster*, Sladen, and *Ampheraster*, Fisher (type, *Sporasterias mariana*, Ludwig), are in some respects intermediate, though they are nearer to *Pedicellaster* than to *Asterias*.

The Heliasteridæ can conveniently be kept separate from the Asteriidæ on the basis of the peculiar structure of the internal skeleton. There is an oblique or horizontal circular shelf which extends from the actinostomial skeleton obliquely upward to the abactinal wall and separates the cœlom of disk from that of ray save for a small passage near the abactinal wall. Ventrally the cœlom of ray ends in a shallow cul-de-sac near the inner end of the ambulacral ridge, where in the Asteriidæ the cœlom of disk communicates with that of ray. Viguier reports the odontophore as consisting of two plates, which is not true of the Asteriidæ.

Genera of the Asteriidæ are now sufficiently numerous to render subfamilies useful. It is well to regard these groups as convenient sections in which to arrange genera of ascertained relationship rather than as units definitely segregated one from another. The Coscinasterinæ is one of the best-marked and most easily recognized. I think all the subfamilies are natural, except the Asteriinæ, which may be resolved into the following sections in accordance with the lettered groups of genera:—(*a*) Asteriinæ, (*b*) Pisasterinæ, (*c*) Stichasterinæ, (*d*) Podasteriinæ, (*e*) Aphelasteriinæ, (*f*) incertæ sedis. Of these, group *a* is sharply marked from the rest by the actual or potential presence of pedicellariæ on the adambulacral spines, though they are absent as an individual and varietal variation in some forms of *Leptasterias*. It is very questionable if such a refinement as the above is at present needed, so that the Asteriinæ in the following synopsis may be considered a sort of residuary legatee. The Pycnopodiinæ is possibly a specialized relative of the Coscinasteriinæ.

The following genera do not occur in the key, except as synonyms:—

Allasterias, Verrill (*Asterias*).
Anasterias, auct. (*Lysasterias*).
Asteroderma, Perrier (*Lysasterias*).
Calycaster, Perrier (*Neomorphaster*).
Cœlasterias, Verrill (*Stichaster*).

Ctenasterias, Verrill (*Leptasterias*).
Diplasterias, Perrier (*Cosmasterias*).
Hemiasterias, Verrill (*Granaster*).
Heterasterias, Verrill (*Coronaster*).
Labidiastrella, Verrill (*Labidiaster*).
Margaraster, Gray.
Nanaster, Perrier (*Stephanasterias*).
Parasterias, Verrill (*Asterias*).
Parastichaster, Koehler (*Sporasterias*).
Pœdasterias, Verrill (*Lysasterias*).
Polyasterias, Perrier (*Coscinasterias*).
Quadraster, Perrier (*Cosmasterias*).
Stichorella, Koehler (*Calvasterias*).
Tonia, Gray (*Stichaster*).

I. *Synopsis of Subfamilies of* Asteriidæ.

a^1. No adoral carina—the first pair of postoral adambulacral plates separated interradially or in contact only along the adoral part of interradial margin; tube-feet biserial, or quadriserial on proximal part of ray.

1. Pedicellasterinæ, Fisher. Rays 5 to 8; skeleton an open network composed of mostly small cruciform or trilobate plates; spinelets small; never more than one prominent inferomarginal spine (except in questionable *Lytaster*); crossed pedicellariæ scattered, never in circlets about spinelets; straight pedicellariæ present; no adambulacral spine pedicellariæ.

Pedicellaster, Sars, *Hydrasterias*, Sladen, *Peranaster*, gen. nov., *Anteliaster*, gen. nov., *Ampheraster*, gen. nov., *Tarsaster*, Sladen, *Lytaster*, Perrier?

a^2. An adoral carina—one, usually several, pairs of postoral adambulacral plates in contact by interradial margins; tube-feet quadriserial, at least proximally.

b^1. Adambulacral spines without attached pedicellariæ, singly or in clusters.

2. Labidiasterinæ, Verrill. Rays numerous, long, slender, in combination with only 1 inferomarginal spine carrying a wreath of crossed pedicellariæ; abactinal skeleton either very open with large squarish meshes or else abortive with scattered independent plates; crossed pedicellariæ in abactinal spinal wreaths or thick ruffs; no actinal plates.

Labidiaster, Lütken, *Coronaster*, Perrier, *Rathbunaster*, Fisher.

3. Notasteriinæ, subfam. nov. Rays 5; with peculiar macrocephalous crossed pedicellariæ; carinal and marginal plates prominent, with prominent spine (inferomarginals in one case with 2); dorsolateral skeleton reticulate, often very weak, the spines poorly developed and without proper wreaths of pedicellariæ; no actinal plates.

Notasterias, Koehler, *Autasterias*, Koehler, *Urasterias*, Verrill, *Icasterias*, gen. nov.

4. Coscinasteriinæ, subfam. nov. Abactinal skeleton well developed, with carinals and often dorsolaterals in definite series. Rays 5 to

many, with prominent, wreathed, spaced, styliform or acicular spines, often in evident longiseries, in combination with: regularly 2 inferomarginal spines, gonads opening dorsally, actinal plates in not more than 1 series, and adambulacral spines entirely devoid of attached pedicellariæ.

Stylasterias, Verrill, *Eustolasterias*, gen. nov., *Astrometis*, gen. nov., *Sclerasterias*, Perrier, *Coscinasterias*, Verrill, *Astrostole*, gen. nov., *Distolasterias*, Perrier, *Lethasterias*, gen. nov., *Marthasterias*, Jullien, *Meyenaster*, Verrill, *Australiaster*, gen. nov., *Orthasterias*, Verrill.

5. Pycnopodiinæ, Verrill. Abactinal skeleton abortive, composed of isolated plates and tongues of ossicles bearing wreathed acicular spines; no actinal plates; rays 5 to many. Otherwise as in 4.
Pycnopodia, Stimpson, *Lysastrosoma*, Fisher.

6. Neomorphasterinæ, subfam. nov. Primary apical plates conspicuously enlarged; abactinal and marginal plates subhexagonal, closely imbricated in 7 regular longiseries (resembling *Zoroaster*), sparsely granulated; actinal plates with short spinelets.
Neomorphaster, Sladen.

b^2. Adambulacral spines carry pedicellariæ singly or in clusters, or are entirely without attached pedicellariæ.

7. Asteriinæ, Verrill. Abactinal spines not as a rule prominent, styliform or acicular and more or less spaced and isolated, but short, slender to stout, conical, tubercular-subglobose, variously granuliform, sharp to capitate, single or in groups; abactinal plates in more or less definite longiseries or irregularly reticulate, sometimes abortive; actinal area sometimes broad, with upwards of 5 longiseries of plates, sometimes without any actinal plates; gonads opening dorsally, laterally, or ventrally.

(1) Adambulacral spines with pedicellariæ.

(a) *Asterias*, Linn., *Evasterias*, Verrill, *Leptasterias*, Verrill, *Stenasterias*, Verrill.

(2) Adambulacral spines entirely without pedicellariæ.

(b) *Pisaster*, M. & T., *Uniophora*, Gray.

(c) *Cosmasterias*, Sladen, *Stichaster*, M. & T., *Allostichaster* Verrill, *Calvasterias*, Perrier, *Stichastrella*, Verrill.

(d) *Podasterias*, Perrier, *Cryptasterias*, Verrill, *Sporasterias*, Perrier, *Lysasterias*, Fisher, *Koehleraster*, Fisher, *Adelasterias*, Verrill.

(e) *Aphelasterias*, gen. nov., *Aphanasterias*, gen. nov. *Stephanasterias*, Verrill, *Smilasterias*, Sladen.

(f) *Granaster*, Perrier, *Gastraster*, Perrier, *Tarsastrocles*, gen. nov., *Saliasterias*, Koehler.

II. *Synopsis of the Genera of* Pedicellasterinæ *and* Labidiasterinæ.

a^1. Rays 5 or 6; not fissiparous.

b^1. Inferomarginal spines not conspicuously larger than the supermarginals, nor forming a prominent longiseries external to the adambulacral spines; the latter are the longest on ray, in

transverse combs of 2 to 5; no quartette of enlarged or especially strong plates in each interbrachium: tube-feet biserial: first post-oral pair of adambulacaal plates widely separated interradially.

c^1. Actinal plates absent, the inferomarginals juxtaposed to the adambulacrals; inferomarginal spinelets small; crossed pedicellariæ all of one kind, small, with numerous small, uniform, terminal teeth; gonads opening on extreme edge of abactinal area. Type, *Asterias ophidion*, Sladen ..... [Sladen*. *Hydrasterias*,

c^2. Actinal plates present; crossed pedicellariæ with one or more enlarged teeth on the distal portion of the jaw.

d^1. Straight pedicellariæ not unusually large nor spatulate-unguiculate; gonads opening ventrally; actinal plates of large specimens in closely imbricated transverse series, the number of plates per series (in some species) increasing on middle third of ray instead of decreasing; *crossed pedicellariæ of two sorts*, the larger with slenderer jaws and 4 large claw-like terminal teeth and 1 to 4 conspicuous teeth on the shank, below the terminal; the smaller (abactinal) pedicellariæ have numerous small terminal teeth, none conspicuously enlarged. Type, *Pedicellaster typicus*, Sars ..... [Sars†. *Pedicellaster*,

d^2. With very large spatulate-unguiculate straight pedicellariæ; gonads opening dorsally; actinal plates in [2] simple longiseries; crossed pedicellariæ, not

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* *Hydrasterias ophidion* is closely related to, possibly the same as, *Pedicellaster sexradiatus*, Perrier. The genus includes also *Pedicellaster improvisus*, Ludwig, eastern Pacific, off Cocos and the Galapagos. Dr. R. Kirkpatrick, of the British Museum, examined the oral angle of *Hydrasterias ophidion* and *Tarsaster stoichodes*, sent pedicellariæ and enlarged photographs of each species. This courtesy has enabled me to "identify" these genera, long misunderstood. The various species of *Hydrasterias* described since Sladen's time belong to other genera—*Eustolasterias* and *Tarsastrocles* principally.

† The generic diagnosis is not based upon the depauperate North Atlantic *typicus* so much as upon large congeneric species such as *P. formatus*, Koehler, *P. antarcticus*, Ludwig, and especially upon *P. magister*, sp. n., from 'Albatross' station 4792, 72 fathoms, off Bering Island, Bering Sea, which differs from *P. typicus* in regularly attaining a gigantic size (R = 85 mm., *r* = 12 mm.). It has an extensive dorsolateral region and a conspicuous actinal area, crossed by transverse series of imbricating four-lobed plates which increase in number per series toward middle third of the ray, and decrease slowly in the final third. The larger of the two sorts of crossed pedicellariæ are larger, slenderer, and have longer terminal claws and only 2 or 3 long slender shank-teeth. *P. pourtalesi* belongs to this genus.

obviously of two different sorts, have 1 or 2 enlarged lateral terminal teeth and numerous small ones. Type, *Pedicellaster chirophorus*, Fisher (Celebes) .... [gen. nov.*. *Peranaster*,

c^3. Actinal plates present; crossed pedicellariæ with the numerous terminal teeth uniformly tiny; gonads opening ventrally; actinal plates in 1 or 2 longiseries; prominent, unguiculate, straight pedicellariæ in some species. Type, *Anteliaster coscinactis*, sp. n. ..... [gen. nov.†. *Anteliaster*,

b^2. External to the adambulacral spines is a longitudinal series of prominent inferomarginal spines conspicuously larger than the superomarginals (which are subequal to the abactinal spinelets); no actinal plates; a quartette of strong interbrachial marginal plates; first pair of postoral adambulacral plates narrowly separated or touching by adoral corners.

c^1. Straight pedicellariæ not unguiculate, not broadly spatulate; an accessory inferomarginal spinelet above the major spine (at least proximally); adambulacral plates diplacanthid or diplacanthid and monacanthid; interbrachial marginals not much enlarged; superomarginals regularly four-lobed (not warped or irregular nor three-lobed). Type, *Tarsaster stoichodes*, Sladen. [Sladen ‡. *Tarsaster*,

c^2. Straight pedicellariæ unguiculate, often also strongly spatulate; no accessory inferomarginal spinelet or tubercle; adambulacral plates predominantly monacanthid (a few plates may be diplacanthid); 2 enlarged interbrachial superomarginals over-

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* Περαν, signifying "on the other side, across," in allusion to the remote habitat of the type-species with reference to its nearest allies—figuratively, with reference to its characters in relation to *Pedicellaster*.

† Ανηλιος, eastern, *i. e.*, the eastern Pacific. The type-species is *Anteliaster coscinactis*, sp. n., 'Albatross' station 4427, south-west of Point San Pedro, Santa Cruz Island, California, 447 to 510 fathoms, black mud, rocks. Rays 5, long, slender, flexible, very gradually tapered to a bluntly pointed extremity; disk small; body-wall thin; spinelets very small, close-set, alternating, on the rather large-meshed skeleton, with small crossed pedicellariæ; abactinal papular areas irregular (in equivalent of about three longiseries); 3 actinolateral regular series of subquadrate meshes (1 intermarginal and 2 actinal); 2 series of slender actinal plates; adambulacral spinelets longer than any of the others, proximally 4 or 3, then 2, in transverse combs; large hand-shaped unguiculate straight pedicellariæ. R=63 mm., r=9 mm., R=7r.

‡ *Tarsaster*, pedicellariæ and enlarged photographs of the type of which I have examined (see footnote on *Hydrasterias*), includes *Sporasterias cocosana*, Ludwig, and *S. galapagensis*, Ludwig, as well as *Asterias fascicularis*, Perrier (*Leptasterias fascicularis*, Verrill), off Guadeloupe, West Indies, 309 fathoms. I have examined specimens of all three species.

lap 2 corresponding, sometimes enlarged inferomarginals; superomarginals often three-lobed or irregularly four-lobed (proximal plates generally fairly regular). Type, *Sporasterias mariana*, Ludwig .... [gen. nov.*. *Ampheraster*,

a^2. Rays 3 to 8, fissiparous; adambulacrals monacanthid; a vertical comb of 3 inferomarginal spines; between inferomarginals of two sides of ray are 5 longiseries of +-form plates bearing on ray 1, on disk 1 to 3 spinelets; tube-feet biserial; crossed and small straight pedicellariæ. (This genus is founded upon obviously young specimens, and may belong elsewhere.) Type, *Lytaster æqualis*, Perrier ..... *Lytaster*, Perrier.

a^3. Rays 9 to 45; a single prominent inferomarginal spine enveloped in a sheath (carrying on the usually expanded distal surface a conspicuous wreath of pedicellariæ).

b^1. Abactinal skeleton reduced to isolated plates bearing slender acicular spines (with a thick distally expanded sheath, bearing large crossed pedicellariæ with numerous shank-teeth and enlarged lateral terminal teeth); alternate superomarginal plates and spines abortive; straight pedicellariæ not spatulate unguiculate; rays 12 to 20, very flexible. Type, *Rathbunaster californicus*, Fisher .... [Fisher. *Rathbunaster*,

b^2. Abactinal skeleton with large squarish meshes; alternate superomarginals not suppressed.

c^1. Rays 9 to 11; abactinal and marginal spines acicular, prominent, solitary, rather widely spaced; skeleton of outer part of ray not reduced to transverse bands of plates carrying cushions of pedicellariæ; straight pedicellariæ large, spatulate, unguiculate. (Includes *Heterasterias*, Verrill.) Type, *Coronaster parfaiti*, Perrier ..... [Perrier. *Coronaster*,

c^2. Rays 5 to 25; marginal and abactinal spinelets not very prominent nor widely spaced, more or less aggregated in transverse bands; skeleton of outer part of ray reduced more or less to transverse arches carrying cushions of pedicellariæ; straight pedicellariæ not large, unguiculate. (Includes *Labidiastrella*, Verrill.) Type, *Labidiaster radiosus*, Lütken ..... [Lütken. *Labidiaster*,

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* Αμφηρης, signifying "having oars on both sides," in allusion to the inferomarginal spines which stand out on either side of the ray, suggesting a bank of oars. The following are the species:—*Ampheraster marianus* (Ludwig); *A. hyperoncus* (Clark), as *Pedicellaster*; *A. distichopus* (Fisher), as *Tarsaster*.

III. *Synopsis of the Genera of the* Asteriidæ (*except* Pedicellasterinæ *and* Labidiasterinæ).

1. The carinal, the conspicuous marginal, and the actinal plates (when present) form regular longiseries; carinals, dorsolaterals (sometimes also in regular longiseries), and superomarginals carry a single stout or slender, smooth or fluted, sharp or blunt, prominent, spike-like spine (sporadically 2 or 3), provided with a collar of crossed pedicellariæ; inferomarginals regularly with 2 prominent spines (sporadically 3); actinal plates never in more than one series, sometimes lacking; adambulacral spines 1 or 2, always without attached pedicellariæ (but these may occur on oral spines); gonads, so far as known, open dorsally; species not pædophoric; (special macrocephalous type of crossed pedicellariæ not present).

a[1]. Only the outer of the two inferomarginal spines carries a cluster of crossed pedicellariæ.

b[1]. Adambulacral plates diplacanthid, at least on proximal half of ray; as a rule only 2, or equivalent of 2, series of dorsolateral papular areas (by no means always regular) on either side of the carinal plates. (Alternate superomarginals usually spineless.)

c[1]. Rays regularly only 5 in adults, but 6 in fissiparous young of some forms.

d[1]. Size medium or large; skin not unusually thick; intermarginal and usually also actinal papulæ; at least 2 longiseries of dorsolateral papulæ.

e[1]. Large spatulate, denticulate, straight pedicellariæ; outer inferomarginal spines without trace of a ventrolateral web; rays semicircular or heptagonal in section; dorsolateral skeleton very irregular, the skeletal meshes not in two regular series on either side of the carinal ridge; dorsolateral spines developed in even tiny specimens; they are numerous, in one or two irregular series on each side; adambulacral plates diplacanthid proximally, monacanthid distally. Type, *Asterias sertulifera*, Xantus ..... [gen. nov.*. *Astrometis*,

e[2]. Straight pedicellariæ, slender, lanceolate; outer inferomarginal spines connected in longiseries by a continuous more or less fibrous web confined to base of spines and sometimes much retracted in dried specimens; rays penta-

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* *Orthasterias gonolena*, Verrill, "off Southern California," is a synonym of *Astrometis sertulifera*. *Orthasterias californica*, Verrill, off San Francisco, and *O. dawsoni*, Verrill, Queen Charlotte Islands, belong to this genus, but are probably only subspecies of *sertulifera*. I have examined the types of both, as well as that of *sertulifera*, which is from Cape San Lucas, Lower California.

gonal in section; dorsolateral skeleton regular, with two series of skeletal meshes on either side of the prominent carinal ridge; dorsolateral spines usually late in developing and in only one series; adambulacral plates diplacanthid throughout; the very young are fissiparous, usually six-rayed, possibly reproducing regularly by fission. [gen. nov.*.
Type, *Coscinasterias euplecta*, Fisher.. *Eustolasterias*,

d^2. Size very small; plates arranged essentially as in young *Eustolasterias*, but covered by a thick skin, marked by strong transverse furrows between consecutive arcs of plates; adambulacral plates diplacanthid; no intermarginal or actinal papulæ; one dorsolateral series of large isolated papulæ on either side of the carinals; (plates of ray above the adambulacrals form seven very regular longiseries, and also regular transverse arcs; inferomarginals with an oblique series of two spines; above these five longiseries of small obtuse spines encircled by a collar of crossed pedicellariæ; dorsal straight pedicellariæ). [Perrier.
Type, *S. guernei*, Perrier ..... *Sclerasterias*,

c^2. Rays 7 to 9; so far as known not fissiparous; in general appearance similar to *Eustolasterias*, but ray less markedly hexagonal in section; a well-developed series of dorsolateral and actinal spines; inferomarginal web absent or very rudimentary; only alternate superomarginals spiniferous, the plates generally with a conspicuous beaded area; mouth-angle rather narrow, with three to five contiguous pairs of postoral adambulacral plates; straight pedicellariæ medium to large, smooth or denticulate. [gen. nov.†.
Type, *Margaraster scaber*, Hutton ..... *Astrostole*,

b^2. Adambulacral plates monacanthid throughout ray.

c^1. One series of spiniferous actinal plates.

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* This genus includes also *Distolasterias hypacantha*, Fisher, *Stolasterias alexandri*, Ludwig, *Asterias angulosa*, Perrier (*Orthasterias subangulosa*, Verrill), *Asterias contorta*, Perrier, *Stolasterias neglecta*, Perrier, *Asterias tanneri*, Verrill, *Asterias mollis*, Hutton.

† Includes also *Asterias rodolphi*, Perrier, *Coscinasterias platei*, Meissner, and *Stylasterias paschæ*, Clark. I have examined a specimen of *Astrostole rodolphi* from Sunday Island, Kermadecs, several *Astrostole scaber* from Wellington, New Zealand, and the type of *Astrostole paschæ* from Easter Island. The last may be the same as *Astrostole platei* (Juan Fernandez), while *Polyasterias fernandensis*, Meissner (Juan Fernandez), is not improbably young *platei*. See Archiv. f. Naturges. 1896, pp. 103, 104, pl. vi. figs. 1, 2.

d^1. Fissiparous, rays 7 to 12; skin covering skeleton not unusually thick and tough. (Crossed pedicellariæ larger, more tapered in profile; large straight pedicellariæ with denticulate jaws.) Type, *C. muricata*, Verrill..... [Verrill. *Coscinasterias*,

e^1. Alternate carinal plates oblong-elliptical, without lateral lobes; mouth-angle very constricted, with five or six contiguous pairs of adambulacral plates behind the mouth-plates. Type, *C. muricata*, Verrill=*A. calamaria*, Lam..... [*asterias*, s. s.*. Subgen. *Coscin-*

e^2. All carinal plates four-lobed; mouth-angle broader, with two or three contiguous pairs of adambulacral plates behind mouth-plates. Type, *A. tenuispina*, Lam..... [*asterias*, Sladen †. Subgen. *Stol-*

d^2. Not fissiparous, rays 5 to 7; skeleton obscured by a thick tough skin; crossed pedicellariæ very small, round-tipped, not conspicuously tapered. (One series of spiniferous actinal plates; dorsolateral skeleton irregularly reticulated, the papular areas equivalent to three or four longitudinal series, but only the lateral-most in a regular series; abundant, large, broadly lanceolate, straight pedicellariæ, with rather compressed denticulate jaws; perhaps a subgenus of *Marthasterias*.) Type, *Asterias gelatinosa*, Meyen..... [Verrill. *Meyenaster*,

c^2. One series of small spineless actinal plates hidden by skin. Not fissiparous; rays 5; dorsolateral skeleton normally fairly regular, the papular areas in two longiseries on either side of the carinal series; dorsolateral and carinal spines either regular or very irregular (*africana*). Type, *Marthasterias foliacea*, Jullien=*Asterias glacialis*, Linn..... [Jullien. *Marthasterias*,

a^2. The inner as well as the outer inferomarginal spine carries a cluster of crossed pedicellariæ; adambulacral plates diplacanthid.

b^1. Secondary oblong ossicles between consecutive plates of both carinal and superomarginal series; crossed pedicellariæ unusually large. All primary plates spiniferous; one or two series of four- or five-lobed dorsolateral plates in quincunx and connected by one or more slender ossicles, forming a very open-meshed skeleton with large, triangular, and lozenge-

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* Includes two distinct species, one of which is the type. The other may be *C. gemmifera* (Perrier).

† *Polyasterias*, Perrier, is a synonym. *Asterias acutispina*, Stimpson, is typical of this group.

shaped papular areas; crossed pedicellariæ characteristically large, with clawed tips; a few relatively huge, unguiculate, straight pedicellariæ; actinal plates rudimentary, spineless; adambulacral spines 2; mouth-angle stout, with two pairs of contiguous postoral adambulacral plates; not fissiparous when adult. Type, *A. forreri*, de Loriol .. [Verrill, *Stylasterias*,

b^2. Carinals and superomarginals directly imbricated in series, without interpolated secondary oblong ossicles; three (or the equivalent of three) or more dorsolateral series (often very irregular) of papular areas on either side of the carinal plates.

c^1. A definite series of well-developed actinal spines each with a conspicuous cluster of crossed pedicellariæ on its outer side; crossed pedicellariæ without two terminal teeth larger than other teeth; straight pedicellariæ large, broadly lanceolate, compressed, to spatulate denticulate or unguiculate; oral carina narrow, with upward of five contiguous pairs of postoral adambulacral plates; actinostome sunken. Type, *O. columbiana*, Verrill=*Asterias kochleri*, de Loriol ..... [Verrill * *Orthasterias*

c^2. Actinal spines absent, or, if present, are devoid of attached pedicellariæ; adoral carina not especially long or narrow, nor actinostome sunken (two or three pairs of contiguous postoral adambulacral plates).

d^1. A definite series of spineless actinal plates hidden under a thick integument; each carinal and superomarginal plate regularly spiniferous.

e^1. Crossed pedicellariæ with two enlarged terminal teeth on each jaw, conspicuously larger than the median terminal teeth; predominant straight pedicellariæ small, slender, lanceolate (a rather slender, large, unguiculate pedicellaria occurs very rarely as a "sport," and, when present, only one or two to a specimen); dorsolateral

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* Of the species described and listed by Verrill (1914, p. 168) under this genus only *columbiana*, *biordinata*, and *koehleri* (all one species) appertain to the group as defined on the basis of its type. Verrill's subgenus *Stylasterias* I hold a very distinct group. His *Orthasterias forreri*, *O. forreri forcipulata*, and *O. leptolena* (under this subgenus) appear to me to be all one species. His *Orthasterias* (*Stylasterias*) *gonolena* (*l. c.* p. 184), as well as *O. californica* and *O. dawsoni* are not closely related to *Orthasterias*, s. s., but are a new generic type, *Astrometis*, Fisher (see *antea*). *Orthasterias merriami*, Verrill (*l. c.* p. 177), has the peculiar anatomical features of *Leptasterias*, and is close to, possibly the same as, *L. coei*, Verrill.

plates not exceptionally numerous, in two or three regular or irregular series on each side. Type, *Asterias* (*Stolasterias*) *stichantha*, Sladen ..... [Sladen*. *Distolasterias*,

e^2. Crossed pedicellariæ without enlarged terminal teeth; predominant straight pedicellariæ relatively very large, broadly spatulate, with long curved tines (resembling a pair of clasped hands); dorsolateral plates very numerous, small, crowded, irregularly arranged, but in the equivalent of four to six (or more) series on each side; (spines ornately fluted). Type, *Distolasterias chelifera*, Verrill = *Asterias nanimensis*, Verrill ..... [gen. nov.† *Lethasterias*,

d^2. A conspicuous series of actinal spines (without a cluster of attached crossed pedicellariæ); crossed pedicellariæ very small, without any of the terminal teeth enlarged; all straight pedicellariæ slender, lanceolate; two pairs of contiguous postoral adambulacral plates; each carinal and superomarginal not regularly spiniferous, usually only the alternate plates; dorsolateral spines few, scattered. Type, *Coscinasterias dubia*, Clark (Tasmania) ..... [gen. nov. *Australiaster*,

2. Marginal and abactinal spines conspicuous, not more than one to a plate, in longiseries, and devoid of a sheath carrying a collar of crossed pedicellariæ; giant crossed pedicellariæ of a peculiar type, with hooked terminally crossed jaws (*macrocephalous*, Koehler) in addition to ordinary crossed pedicellariæ and straight pedicellariæ (of two or three sorts); dorsal skeleton consisting of large, cruciform, spiniferous carinals (alternating sometimes with secondary smaller plates), to which transverse dorsolateral arcs of plates connect the superomarginals; primary spiniferous dorsolaterals poorly developed; marginals large, cruciform; one series of actinals; adambulacral spines without attached pedicellariæ.

a^1. Adambulacral plates diplacanthid proximally and monacanthid distally or diplacanthid throughout. Type, *N. armata*, Koehler ..... [Koehler. *Notasterias*,

a^2. Adambulacral plates monacanthid throughout. Type, *A. pedicellaris*, Koehler ..... [Koehler. *Autasterias*,

[To be continued.]

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* Includes also *Stolasterias robusta*, Ludwig, Galapagos Islands.

† This group seems to be most nearly related to *Distolasterias*, of which some may prefer to regard it a subgenus. It is, indeed, unfortunate that the type-species is the same as *Asterias nanimensis*, of which I have carefully examined the type-specimen. I have also examined the type and many specimens of *chelifera*. The type of the genus is, therefore, *Distolasterias nanimensis* (Verrill) or *Lethasterias nanimensis*.

XXIX.—*Carnivora from the Dera Bugti Deposits of Baluchistan.* By C. Forster Cooper, M.A., Superintendent of the University Museum of Zoology, Cambridge.

Specimens of Carnivora from the early Miocene deposits of Dera Bugti are rare. Dr. Pilgrim *, in his exploration of this region, was unable to secure more than fragments of two species, viz., *Pterodon bugtiensis*, one of the largest of known Creodonts, and a form originally described as a new species of the genus *Cephalogale* with the specific name *shahbazi*. This latter form Dr. Pilgrim † subsequently transferred to the genus *Amphicyon* after an examination of a specimen found by the present writer. In his memoir ‡ on the extinct fauna of this district Dr. Pilgrim also mentioned a tooth as belonging to a form closely allied to *Amphicyon major*, but in the subsequent note † he considers all the fragments as referable to the one form *A. shahbazi*.

The specimens of Carnivora obtained by the present writer consist only of two unworn lower carnassial teeth; a portion of a lower jaw with the roots of the fourth premolar and last molar, but with the first and second molars in good condition; a fragment of a maxilla with part of the third premolar and with the fourth premolar and two molars complete; and two fragments of limb-bones as mentioned below.

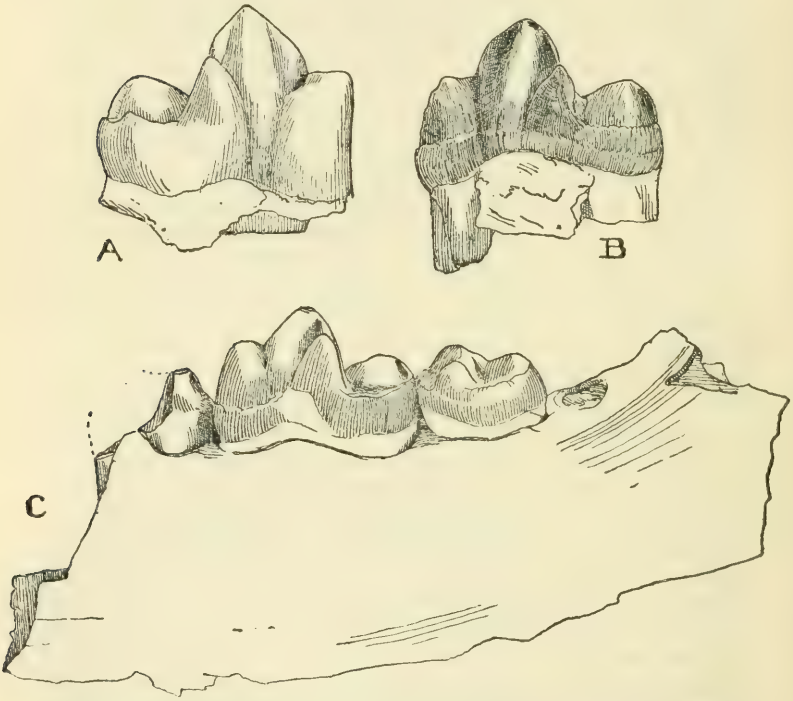
Of the lower teeth the three specimens show only small differences in structural detail, but vary in size from the largest, which in measurements is equal to, and is not distinguishable in any particular from, a cast of Lydekker's specimen of *Amphicyon palæindicus* § from the "Siwalik" formation [Upper Chinji horizon ‖] of Nurpur. It is an absolutely unworn specimen, which shows only the faintest trace of a cingulum. The inner border of the posterior part of the tooth (entaconid) consists of two small cusps, just as in the type-specimen of *A. palæindicus*.

The next specimen, which is the one that has been referred to by Dr. Pilgrim † and identified as *A. shahbazi*, is a little smaller, and differs in having the cingulum more marked on the outer border of the tooth, and the entaconid region, in place of the

* Pilgrim, Pal. Ind. n. s., vol. iv. Memoir 2 (1912).
† Pilgrim, Rec. Geol. Surv. Ind. vol. xliii. part 1 (1913).
‡ *Loc. cit.* (1912).
§ Lydekker, Pal. Ind. ser. x. vol. ii. pl. xxxii.
‖ Pilgrim, "Correlation of the Siwaliks," Rec. Geol. Surv. Ind. vol. xliii. part 4 (1913).

two small cusps, has a flat shelf with a crenelated edge. The third specimen is considerably smaller, but in other respects resembles the last specimen. The second molar, which is present in this fragment, differs from the figure of a specimen given by Lydekker * and referred by him to *A. palæindicus* in being not only smaller but proportionally shorter in length

Fig. 1.



A. Lingual view of left lower carnassial of *Amphicyon palæindicus* (Lyd.).
B. Lingual view of right lower carnassial of *A. shahbazi* (Pilg.).
C. Lingual view of a fragment of a lower jaw of a smaller form referred to *A. shahbazi* (Pilg.).

All figures natural size.

to breadth. The root of the third molar is single instead of double as in Lydekker's figure.

As the first of these teeth is indistinguishable from *A. palæindicus*, it must be referred to that species. The other two,

* Lydekker, *loc. cit.* pl. xxxii. fig. 4.

Fig. 2.

Portion of a left maxilla of *Cephalogale bugtiensis*, sp. n. Nat. size.

Fig. 4.

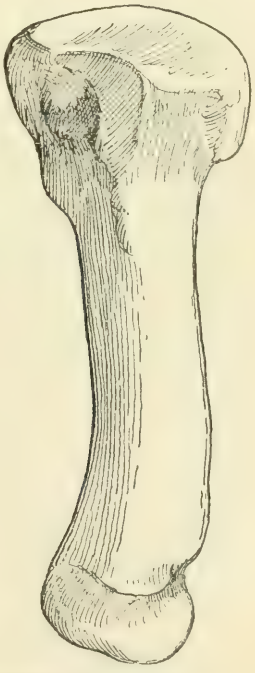


Fig. 3.

Fig. 3.—Distal end of a humerus of *Amphicyon* sp. Nat. size.
Fig. 4.—Metacarpal of *Pterodon*?. Nat. size.

if the small differences of cingulum and entaconid are constant and are to be regarded as of specific value, may be referred to *A. shahbazi*.

The measurements of these teeth (in millimetres) are as follows):—

	First molar:		Second molar:	
	length.	breadth (across talonid).	length.	breadth (across front half).
A. palæindicus	32	16	..	..
A. shahbazi	31	14	..	..
A. shahbazi	27	15	18	13·5

Cephalogale bugtiensis, sp. n.

The fragment of an upper dentition, although too much weathered to be placed with certainty, may be referred to the genus *Cephalogale*, the small size of the third premolar and curvature of the hinder part of the dental series suggests, at any rate, one of the short-nosed genera. The carnassial has a low forwardly-directed inner cusp (protoconid) and a long well-separated metastyle. As the subjoined measurements show, this carnassial, when compared with the first molar, is on the small side, the comparative proportions being less than those of the wolf, an animal of approximately the same general size. The first molar is bluntly triangular, with a heavy internal cingulum behind the protocone. The second molar is an oblong tooth, rather wider on the outside, and with a blunt, almost square protocone, but is too much weathered for accurate description. It is separated from the preceding molar by a considerable diastema, a small point in which this specimen agrees with one of *Cephalogale geoffroyi* figured by Filhol*. The fragment, although not in good preservation, shows clearly enough that there was no third molar developed, and this, together with the small size of the third premolar (of which only the posterior half is present), is sufficient to exclude the form from the genus *Amphicyon*. There is a general resemblance to *C. geoffroyi*, Filhol, but this specimen is considerably larger. The measurements (in millimetres) are:—

	Pm. 3.	Pm. 4.	M. 1.	M. 2.
Antero-posterior	..	22	16	10
Transverse	5	13·5	19	15

* Filhol, Arch. du Mus. d'Hist. Nat. de Lyon, vol. iii. 1883, plate ii. fig. 1.

The limb fragments consist of a distal end of a right humerus about the size of a large wolf. As there is a well-marked entepicondylar foramen, it may be referred to one of the species of *Amphicyon*. The other specimen is a foot-bone, possibly a fourth metacarpal. It is about the size of that of a tiger in length, but is more massive. It is too large for the species of *Amphicyon*, and may, perhaps, belong to the large Creodont *Pterodon bugtiensis* described by Pilgrim.

It is convenient here to notice the presence in these deposits of a small Cetacean represented by part of the tympanic bone. It has the size and general appearance of the corresponding bone of *Platanista gangetica*.

XXX.—*Note on a Lower Jaw of an African Elephant.* By C. Forster Cooper, M.A., Superintendent of the University Museum of Zoology, Cambridge.

In the collection of the University Museum of Zoology at Cambridge there is a lower jaw of an African elephant of unusual form and of sufficient interest to be worth noting. The specimen was purchased at the sale of Dr. Baikie, the African traveller, in 1865, and consists of the lower jaw alone, to which no further history is attached. It is a young adult specimen, with the second molar in full wear and the third just erupted.

The peculiarity of this specimen lies in the unusual length of the symphysis, which measures 22 cm. from the extreme tip to a point in the middle line of the posterior border of the symphysis. A similar measurement of another specimen of an African elephant in the collection and of about the same age is only just over 12 cm. The symphysis, moreover, instead of turning downwards in the usual way, runs straight forwards in a manner reminiscent of the much earlier elephants, such as *Tetrabelodon*. The early ancestry of the African elephants is at present little known, but they must be descended from forms in which the jaws were longer than they are at present. To what extent the present specimen is reminiscent of that ancestry cannot be stated, and it would be unwise to make too much of it; but it is, at all events, an interesting variation from the normal.

The figures show the specimen from above and from the side. The dotted line in the second figure is put in from

Fig. 1.

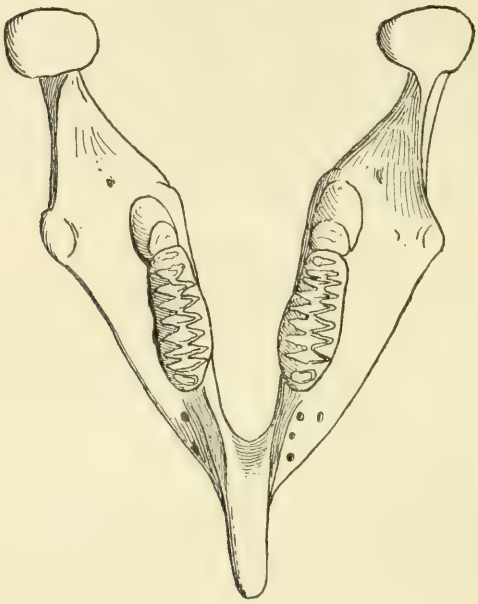


Fig. 2.

the second and more normal of the specimens mentioned above.

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AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 69. SEPTEMBER 1923.

XXXI.—*New or little-known* Tipulidæ (*Diptera*).—XVII. *Australasian Species*. By Charles P. Alexander, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

The crane-flies described in the present instalment are all from the South Island of New Zealand, where they were collected in the Provinces of Westland, Otago, and Southland by my friends Messrs. Campbell, Fenwick, Harris, Oliver, and Lindsay, to whom my sincere thanks are extended. The types are preserved in the writer's collection.

Dicranomyia paradisea, sp. n.

Belongs to the *huttoni* group; size large (wing of ♂ 8·5 mm. or more); general coloration reddish brown, the antero-median region of the præscutum infuscated; pleura largely dark brown; femora with a very narrow subterminal brown ring; wings strongly tinged with yellow; cord and outer end of cell 1*st* M_2 broadly infuscated; a very small seam at origin of *Rs*; abdomen dark brown, the hypopygium obscure yellow.

Male.—Length 7 mm.; wing 8·9 mm.

Female.—Length 7·4–7·5 mm.; wing 8·6–8·8 mm.

Rostrum relatively short, about one-half longer than the head, dark brown; palpi black. Antennæ black throughout; pedicels of flagellar segments conspicuous in both sexes. Head dark grey.

Mesonotum reddish brown, the antero-median area of the præscutum slightly infuscated. Pleura dark brown, the propleura obscure brownish yellow; pleuro-tergite of postnotum infuscated. Halteres obscure yellow, the knobs darker. Legs with the coxæ and trochanters obscure yellow; femora yellow with a narrow and relatively indistinct subterminal brown ring; tibiæ and basal three tarsal segments brownish yellow; terminal tarsal segments dark brown. Wings strongly tinged with yellow; stigma oval, dark brown, conspicuous; conspicuous brown seams along the cord and outer end of cell 1*st* M_2; seam at origin of *Rs* and on Sc_2 very narrow and indistinct; a brown seam behind vein *Cu*; veins dark brown, those at wing-base and in costal region more yellowish. Venation: *Sc* short, Sc_1 ending shortly beyond the origin of *Rs*; Sc_2 about opposite this origin; basal deflection of Cu_1 at the fork of *M*.

Abdomen dark brown, the basal sternites a little paler; hypopygium obscure yellow; male hypopygium with the ninth tergite semicircular in outline, divided by a U-shaped notch into rounded lobes. Ventral dististyle with a long rostrum, the spines separate, the outer spine shorter; setæ at apex of rostrum on cephalic side more slender than in *cubitalis*. Dorsal dististyle less strongly curved than in *cubitalis*. Gonapophyses with the mesal apical lobe very long, infuscated. Ovipositor with the valves reddish horn-colour.

Hab. New Zealand (South Island).

Holotype, ♂, Paradise, Wakatipu District, Otago, December 22, 1922 (*C. C. Fenwick*).

Allotopotype, ♂.

Paratopotype, ♀.

Dicranomyia unicornis, sp. n.

Belongs to the *huttoni* group; head dark grey; mesonotum dull brown, the lateral margins of the præscutum brightening into ochreous; femora with a conspicuous black subterminal ring; wings faintly tinged with yellow, the stigma brown; abdominal segments narrowly ringed caudally with yellow; male hypopygium with the rostrum of the ventral dististyle bearing a single very conspicuous spine; tergal valves of ovipositor very short, upcurved.

Male.—Length 5·5 mm.; wing 6·8–7 mm.

Female.—Length about 6·5 mm.; wing 6·5–7 mm.

Rostrum black, including the palpi, the rostrum about twice the length of the head. Antennæ black, the basal flagellar segments feebly bicolorous, especially in the female,

the base of each segment being narrowly pale. Head dark grey.

Mesonotum dull brown, the lateral margins of the præscutum and scutal lobes brightening into ochreous; anterior margins of scutal lobes slightly darkened; median area of scutum and the scutellum pale; postnotum yellow, darkened posteriorly. Pleura obscure yellow, the dorsal sclerites strongly infuscated, the ventral sclerites more or less pruinose; sterno-pleura sometimes more or less infuscated. Halteres very pale brown. Legs with the coxæ pale, very indistinctly infuscated; trochanters yellow; femora yellow, with a conspicuous but narrow black ring that is about its own length before the tip; tibiæ and metatarsi yellow, passing into brown at tip; remaining tarsal segments gradually passing into brown. Wings with a faint yellow tinge; stigma oval, pale brown; cord and outer end of cell 1*st* M_2 very narrowly and indistinctly seamed with darker; veins dark brown. Venation: *Sc* ending opposite or a short distance beyond the origin of *Rs*, Sc_2 not far from its tip; basal deflection of Cu_1 at or near the fork of *M*.

Abdomen black, the basal segments narrowly but distinctly ringed with obscure yellow; in the male segments 5 to 7 more uniformly brown; in most females all the tergites are conspicuously ringed with yellow; sternites often pale, with the lateral margins darkened; male hypopygium obscure reddish. Male hypopygium with the ninth tergite having a shallow U-shaped notch, each lateral lobe and a median area setiferous. Mesal lobe of basistyle very large and broad, densely setiferous; dorsal dististyle gently arcuated, the acute apex suddenly curved; ventral dististyle relatively small with a conspicuous rostrum that bears a single very long and powerful spine that is longer than the rostrum alone, directed slightly basad. Mesal apical angle of each gonapophyse produced into a long slender rod that is weakly serrulate along the lateral margin. Ovipositor with the tergal valves very short and strongly upcurved.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 17, 1923 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, 40 ♂ ♀, February 17–23, 1923 (*T. R. Harris*); *paratypes*, 5 ♂ ♀, Greymouth, Westland, February 27, 1923 (*T. R. Harris*).

Dicranomyia tricuspis, sp. n.

Belongs to the *fasciata* group; general coloration dark

grey; wings subhyaline, sparsely variegated with grey; no cloud at origin of *Rs*, but a conspicuous seam along the cord; cell 1*st* M_2 open by the atrophy of *m*; male hypopygium with each gonapophyse tricuspid.

Male.—Length 5–5·5 mm.; wing 6·2–6·5 mm.

Female.—Length about 5·5 mm.; wing 6 mm.

Rostrum and palpi brownish black. Antennæ small, black throughout. Head dark grey.

Mesonotum brownish black, very sparsely grey-pruinose; scutellum and postnotum light grey. Pleura black, sparsely grey-pruinose. Halteres dark brown, the base of the stem light yellow. Legs with the fore and middle coxæ concolorous with the pleura; posterior coxæ paler, obscure yellow; trochanters yellowish testaceous; femora brown, paler at base; tibiæ and tarsi black. Wings subhyaline; prearcular region paler; membrane clouded with brownish grey; stigma oval, brown; a broad and conspicuous seam along the cord; a conspicuous cloud at base of cell M_3; postarcular region indistinctly infuscated; veins dark brown. Venation: *Sc* short, Sc_1 ending opposite or close to the origin of *Rs*, Sc_2 some distance from the tip of Sc_1, the latter alone longer than the basal deflection of Cu_1; *Rs* short, gently arcuated, about one-third to one-half longer than the basal deflection of R_{4+5}; cell 1*st* M_2 open by the atrophy of *m*; cell M_3 usually shorter than its petiole; basal deflection of Cu_1 close to or before the fork of *M*. In the allotypic ♀ *Rs* is long-spurred near origin.

Abdomen with the basal sternites paler than the remaining segments, which are dark slate-black, including the hypopygium. Male hypopygium with the ninth tergite scarcely notched medially. Basistyle with the mesal lobes relatively low, terminating in a pencil of spinous bristles; ventral dististyle small, fleshy, narrowed apically, and here with a fringe of setæ; no rostrum; dorsal dististyle gently curved, suddenly narrowed to the acute apex. Gonapophyses terminating in three spines or teeth, there being a median pale tooth. Ovipositor with the tergal valves very slender, acute.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, 5 ♂ ♀.

Dicranomyia cinerella, sp. n.

General coloration grey, the præscutum infuscated except laterally; antennæ black throughout; legs black, only the

femoral bases narrowly pale; wings tinged with brown; stigma elongate, darker brown; *Sc* short, Sc_1 longer than *Rs*; abdomen dark brown; ventral dististyle of male hypopygium very large and fleshy.

Male.—Length about 7·5 mm.; wing 9 mm.

Rostrum black, grey-pruinose; palpi black. Antennæ black throughout, the flagellar segments oval. Head dark grey.

Mesonotal præscutum dark brownish grey, the lateral margins and humeral region ashy grey; scutum grey, the centres of the lobes infuscated; scutellum and postnotum light grey. Pleura light grey-pruinose throughout. Halteres relatively short, pale, the knobs darker. Legs with the coxæ dark grey; trochanters infuscated apically; femora black, only the narrow bases paler; remainder of the legs black. Wings rather strongly tinged with brown; stigma elongate, darker brown; barely visible brown seams along the cord; veins dark brown. Venation: Sc_1 ending about opposite the origin of *Rs*, Sc_2 removed to a distance from the tip of Sc_1 that is greater than the length of *Rs*; *Rs* strongly arcuated; basal deflection of R_{1+5} nearly straight, about two-thirds *Rs*; cell 1*st* M_2 elongate, gently widened distally; basal deflection of Cu_1 at the fork of *M*.

Abdomen dark brown, the basal sternites slightly paler. Male hypopygium with the apex of the ninth tergite with a conspicuous U-shaped median notch; basistyles of hypopygium small; ventral dististyle very large, fleshy, the rostral prolongation small with two relatively short, subequal spines; dorsal dististyle relatively small. Gonapophyses with the mesal apical angle produced into a short lobe that is slightly curved at apex.

Hab. New Zealand (South Island).

Holotype, ♂, Paradise, Wakatipu District, Otago, December 22, 1922 (*C. C. Fenwick*).

Molophilus imberbis, sp. n.

Belongs to the *macrocerus* group; wings broad, distinctly tinged with brown; male hypopygium with the basal dististyle very conspicuous, appearing as a long cylindrical stem, dilated at the apex into a short triangular head.

Male.—Length about 4 mm.; wing 5·2–5·6 mm.

Rostrum and palpi black. Antennæ elongate, dark brown, if bent backward extending to about opposite mid-length of the abdomen, its structure as in the *macrocerus* group of species. Head dark grey.

Mesonotal præscutum and scutal lobes dark brownish

grey, the humeral region and lateral margins of the former narrowly ochreous; remainder of the mesonotum dark brown. Pleura shiny, dark brown. Halteres yellow throughout. Legs with the coxæ and trochanters obscure yellow; femora yellow, the tips indistinctly darkened; tibiæ brownish testaceous, the tips and the tarsi darker. Wings broad, distinctly tinged with brown; macrotrichiæ and veins darker brown. Venation: basal deflection of Cu_1 a short distance beyond the fork of M; vein *2nd A* elongate, ending about opposite three-fourths the length of the petiole of cell M_3.

Abdomen dark brown, with yellowish setæ; hypopygium brighter brown. Male hypopygium of the structure of the *macrocerus* group, the outer dististyle small; basal dististyle very conspicuous, appearing as a long, slender, cylindrical stem that gradually dilates into a short triangular blade, the apex and margins for a short distance back from the tip provided with black spinous setæ; no setæ or spines except at or near the apex.

Hab. New Zealand (South Island).

Holotype, ♂, Greymouth, Westland, February 12, 1923 (*T. R. Harris*).

Paratopotypes, 2 ♂♂.

Molophilus remotus, sp. n.

Belongs to the *macrocerus* group; male hypopygium with the basal dististyle before the middle of its length armed with a dense area of black setæ and terminating in a long straight spine.

Male.—Length about 3·5–3·8 mm.; wing 4–4·6 mm.

Rostrum and palpi dark brown. Antennæ elongate, only a little shorter than the entire body; scapal segments dull ochreous, the flagellum black; structure as in the *macrocerus* group of species. Head brownish black.

Mesonotum dark brown, in some specimens the humeral region and lateral margins rather narrowly ochreous. Pleura dark brown-pruinose. Halteres pale brown, the base of the stem a little paler. Legs with the coxæ and trochanters ochreous; femora brown, the bases more yellowish; remainder of the legs darker, the terminal tarsal segments black. Wings tinged with brown, the veins and macrotrichiæ still darker brown. Venation: about as in *M. imberbis*, sp. n.; vein *2nd A* ending about opposite two-thirds the length of the petiole of cell M_3.

Abdomen dark brown, including the hypopygium. Male hypopygium of the structure of the *macrocerus* group. Basal dististyle elongate and conspicuous, slender basally, before

mid-length on the mesal face produced into a short chitinized ridge that is densely set with abundant black spinous setæ; beyond this point, the style is curved gently mesad and becomes feebly dilated, the apex running out into a long, straight, black spine.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Paratopotypes, ♂; *paratypes*, 1 ♂, Greymouth, Coal Creek Track, February 13, 1923 (*T. R. Harris*); 4 ♂♂, Ross, Westland, February 17–21, 1923 (*T. R. Harris*).

Molophilus evanidus, sp. n.

General coloration grey; antennæ of the male moderately elongate; wings relatively narrow, faintly tinged with brown; male hypopygium with the dististyles elongate, the basal style bifid at apex, at near two-thirds the length with a conspicuous erect black spine.

Male.—Length about 3 mm.; wing 3·4–3·6 mm.

Rostrum and palpi black. Antennæ of the male moderately long, if bent backward extending to beyond the base of the abdomen, black throughout. Head with the centre of the vertex dark grey, the orbital regions ochreous.

Mesonotal præscutum and scutum dark grey, the humeral region and the latter ends of the pronotal scutellum sulphur-yellow; pseudo-sutural foveæ linear, black; scutellum yellow, sparsely whitish-pruinose; postnotum dark grey, the lateral and cephalic regions of the medio-tergite more yellowish. Pleura grey, indistinctly striped longitudinally across the dorsal margin of the sterno-pleura with obscure yellow. Halteres short, pale brown, the stem yellow. Legs with the coxæ, trochanters, and femoral bases pale brown, the remainder of the legs darker brown. Wings relatively narrow, faintly tinged with brown; veins and macrotrichiæ light brown. Venation: vein *2nd A* relatively short, ending just beyond the base of the petiole of cell M_3.

Abdomen dark brown, the extreme caudal margins of the basal tergites yellowish; hypopygium reddish brown. Male hypopygium with the basistyle terminating in a tiny, black, conical spine. Dististyles elongate, the outer pair more than one-half the length of the basal; outer style slender, the apex dilated, twisted, with a straight, appressed, black spine at the base of the dilated portion; basal style straight basally, beyond mid-length feebly dilated into a blade, thence gradually narrowed into the slender and more chitinized apical third; apex split into two spines; at about two-thirds the length of

the style on the ventral face a conspicuous, erect, black spine.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 17, 1923 (*T. R. Harris*).

Paratopotype, ♂, February 21, 1923.

Molophilus picturatus, sp. n.

General coloration yellow, the mesonotum spotted with brown; head infuscated; pleura yellow, striped longitudinally with dark brown; legs yellowish white, the apices of the segments blackened; wings whitish subhyaline, variegated with brown.

Male.—Length about 2·7 mm.; wing 2·9–3 mm.

Female.—Length 2·6 mm.; wing 3·3–3·4 mm.

Described from alcoholic material.

Rostrum and palpi dark brown. Antennæ with the basal segment pale, the second scapal segment infuscated; flagellum pale. Head infuscated, the orbital regions paler.

Mesonotal præscutum yellow with three pale brown stripes that are sometimes obsolete, their anterior ends in all cases darkened to produce a spotted appearance; scutal lobes infuscated; scutellum yellow; postnotum dark brown. Pleura yellow with a conspicuous brown longitudinal stripe extending from the prothorax across the dorsal pleurites to the postnotum; sterno-pleura and meron likewise infuscated. Halteres pale. Legs with the coxæ and trochanters pale yellow; femora yellowish white, the tips broadly dark brown, the fore femora with an ill-defined subterminal ring of pale brown; tibiæ and basal two tarsal segments yellowish white, the tips broadly blackened; terminal three tarsal segments blackened. Wings whitish subhyaline, variegated with brown; a dark spot at *h* continued across the arculus; a broad band extends from the stigma completely across the wing, following the entire length of *Cu* and Cu_2; an extensive infuscated area near mid-length of cell *2nd A* and the adjoining parts of *1st A*; anal angle darkened; veins pale, darker in the infuscated areas. Venation: *2nd A* moderately elongate, ending shortly beyond the fork of *M*.

Abdominal tergites brown, the pleural region paler; sternites yellowish brown. Male hypopygium of the general type of *M. plagiatus*, Alexander, and allies. Basal dististyle a straight rod that is feebly darkened apically, the outer margin with very weak appressed serrations.

Hab. New Zealand (South Island).

Holotype, ♂, Glenorchy, Wakatipu District, altitude 1200 feet, January 1, 1923 (*F. S. Oliver*).

Allotopotype, ♀.

Paratopotypes, 7 ♂ ♀.

All types preserved in alcohol.

Molophilus analis, sp. n.

General coloration yellow; antennæ short; wings relatively broad, strongly suffused with yellow; 2nd anal vein very long; male hypopygium with the basal dististyle straight, only the extreme apex darkened and weakly toothed.

Male.— Length 3·8–4 mm.; wing 3·8 mm.

Female.—Length 4–4·2 mm; wing 4 mm.

Described from alcoholic specimens.

Rostrum yellow, the palpi brown. Antennæ short, pale brownish yellow. Head yellow.

Mesonotum and pleura clear yellow, unmarked. Halteres short, pale throughout. Legs yellow, only the terminal tarsal segments darkened. Wings relatively broad, strongly tinged with yellow, the costal and stigmal regions and a seam at the base of vein *Cu* darker yellow; veins yellow; macrotrichiæ pale brown. Venation: vein *2nd A* very long, terminating opposite the base of cell M_3.

Abdomen pale yellowish brown, the hypopygium yellow. Male hypopygium with basistyles terminating in slender beaks, only the extreme apex of each blackened. Outer dististyle deeply bifid, the arms separated by a U-shaped notch; basal dististyle of the general type of *M. plagiatus*, Alexander, and allies; a rather stout, straight, pale rod, the extreme apex darkened and very weakly and sparsely toothed.

Hab. New Zealand (South Island).

Holotype, ♂, Glenorchy, Wakatipu District, Otago, altitude 1200 feet, January 1, 1923 (*F. S. Oliver*).

Allotopotype, ♀.

Paratopotypes, 6 ♂ ♀.

Molophilus basispina, sp. n.

General coloration yellow; præscutum with three conspicuous dark brown stripes; pleura largely yellow, the sterno-pleura narrowly dark brown; base of fore tibiæ infuscated; wings faintly tinged with greyish yellow; male hypopygium with the basal dististyle a powerful straight spine, with a smaller lateral spine at its base.

Male.—Length about 4 mm.; wing 3·8 mm.

Described from an alcoholic specimen.

Rostrum and palpi brown. Antennæ short, dark brown throughout. Head infuscated.

Mesonotal præscutum yellow with three conspicuous dark brown stripes; scutum obscure yellow, each lobe extensively dark brown; scutellum obscure yellow; medio-tergite of postnotum dark brown, the antero-lateral angles extensively yellow; pleuro-tergites yellow with a small brown spot immediately cephalad of the base of the halter. Pleura yellow, the sterno-pleura and meron dark brown ventrally. Halteres pale, the knobs whitish. Legs with the fore and middle coxæ weakly infuscated, the posterior coxæ yellow; trochanters yellow; only a single (fore) leg remains; femora yellowish brown; tibia yellow, the base extensively infuscated; tarsi broken. Wings faintly tinged with greyish yellow; veins yellow; macrotrichiæ pale brown. Venation: vein *2nd A* long, ending about opposite mid-length of the petiole of cell M_3.

Abdomen dark brown. Male hypopygium with the basistyle produced into a high flattened beak that is pale in colour, feebly chitinized. Outer dististyle only feebly bifid at apex. Basal dististyle consisting of a powerful blackened spine, elongate-conical in shape; on outer side at base a smaller, slightly curved spine, the apical half blackened. What seems to be a projection from the ninth tergite projects caudad as a tiny Y-shaped structure.

Hab. New Zealand (South Island).

Holotype, ♂, Glenorchy, Wakatipu District, Otago, altitude 1200 feet, January 1, 1923 (*F. S. Oliver*).

Gynoplistia neonebulosa, sp. n.

Female.—Length 22·5 mm.; wing 8·2 mm.; abdomen alone 19 mm.

Related to *G. nebulosa*, Edwards, differing as follows:—

Pectinations of basal flagellar segments moderately long, the longest (flagellar segments 2–3) about two-thirds the length of the segment; flagellar segments at least three times as long as broad. Mesonotal præscutum with three brown stripes. Legs with the femora reddish brown, the tips slightly darker brown (in *nebulosa* there is a narrow, dark brown, subterminal ring); legs longer than in the corresponding sex of *nebulosa*. Wings with the dark markings smaller but deeper in colour, these including the blotches at base of cell *R*, at origin of *Rs*, the seam along the cord and a spot at the end of R_2; wing-tip practically clear; veins

yellowish, darker in the infuscated areas. Abdomen elongate, as shown by the measurements above; sternal valves of ovipositor blackened.

Hab. New Zealand (South Island).

Holotype, ♀, Lake Manapouri, Southland, altitude 600 feet, January 1–7, 1923 (*S. Lindsay*).

Gynoplistia princeps, sp. n.

Size large, form robust; antennæ 23-segmented; mesonotum shiny chestnut-brown; pleura longitudinally striped with shiny brown and brownish grey; wings subhyaline, with a very sparse brown pattern; vein 1*st A* bent strongly caudad just before mid-length.

Male.—Length 14·5 mm.; wing 14 mm.

Rostrum light brown, the mouth-parts obscure orange; palpi light brown, the terminal segments a little darker. Antennæ 23-segmented, the formula being 2+2+14+5; first scapal segment brown; second segment and rhachis of flagellar segments 1 and 2 orange; remainder of antennæ brownish black; the longest branch is about two-fifths the length of the flagellum. Head dark brownish grey, more reddish anteriorly.

Mesonotal præscutum with the disk shiny chestnut-brown, the broad humeral regions and narrower lateral margins duller brown; scutal lobes shiny brown; scutellum and postnotum dull brown, the latter darkened and shiny posteriorly. Pleura shiny brown, with longitudinal stripes of brownish-grey pollen. Halteres obscure orange. Legs with the coxæ dark-coloured, buffy-grey pruinose; trochanters obscure yellow; femora orange-brown, the tips scarcely darkened; tibiæ light brown, the tips indistinctly darkened; tibial spurs acutely pointed; tarsal segments 1–2 light brown, a little darkened at their tips; terminal tarsal segments dark brownish black. Wings subhyaline, with a very sparse brownish-grey pattern; a tiny cloud at the base of cell *R*; a small spot at origin of *Rs*; stigma oval, brown; a circular cloud at *r–m*; less distinct seams along the remainder of the cord; outer end of cell 1*st* M_2; along some of the longitudinal veins; beyond mid-length of vein 1*st A* in cell 1*st A* and in the anal angle; veins brown. Venation: *Sc* long, Sc_2 a little longer than Sc_1 and ending just before the tip of R_{2+3}; *Rs* very long; cell M_1 about twice the length of its petiole; cell 1*st* M_2 relatively short, the basal deflection of Cu_1 near one-third its length; vein 1*st A* deflected strongly caudad just before mid-length; vein 2*nd A* strongly sinuous.

Abdomen with the basal tergite shiny chestnut-brown; subterminal segments sparsely brownish-grey pruinose.

Hab. New Zealand (South Island).

Holotype, ♂, Greymouth, Coal Creek Track, Westland, February 18, 1923 (*T. R. Harris*).

Gynoplistia subobsoleta, sp. n.

Allied to *G. speciosa*, Edwards; antennæ of the male 20-segmented; mesonotal scutum and posterior portions of the præscutum shiny greenish brown; femora brownish yellow with rather broad subterminal brown rings; posterior tibiæ with a subobsolete whitish ring; wings subhyaline with a heavy dark brown pattern.

Male.—Length 9–11 mm.; wing 9·5–12 mm.

Female.—Length 15–16 mm.; wing 12 mm.

Rostrum and palpi brown. Antennæ 20-segmented in the male, the formula being 2+2+12+4; in the female, the antennæ are 18-segmented, with nine branched segments; antennæ with the scape fulvous, the flagellum and branches black; branches elongate in the male, the longest approximately one-half the length of the flagellum. Head shiny black, the occiput and anterior portion of the vertex more reddish.

Pronotum shiny chestnut-brown. Mesonotal præscutum and scutum shiny greenish brown, the former passing into chestnut-brown cephalad of the pseudosutural foveæ; in some cases the green colour is restricted to the scutal lobes; scutellum and postnotum shiny chestnut-brown. Pleura chestnut-brown, sparsely dusted with light grey, the dorsopleural region velvety-black. Halteres obscure orange. Legs with the coxæ chestnut-brown, sparsely light grey pruinose; trochanters yellowish brown; femora brownish yellow with rather broad, conspicuous, dark brownish-black subterminal rings, the extreme apex narrowly pale; tibiæ brown, the tips blackened; posterior tibiæ with a broad, diffuse, nearly obsolete, whitish ring near mid-length, the setæ being uniformly dark; tarsi brownish black; tibial spurs flattened, the oblique apex microscopically serrulate. Wings subhyaline, with a heavy dark brown pattern, including cell *Sc*; a subquadrate area at origin of *Rs*; a broad band across the wing at the level of the cord, including the stigma but leaving the centre of cell 1*st* M_2 pale; wing-apex broadly infuscated; a conspicuous cloud along vein 1st *A*, more extensive opposite the level of the origin of *Rs*; an infuscation along vein 2*nd A* in cell 2*nd A*; veins dark brown, paler at the wing-

base. Venation: Sc_2 ending just before the fork of R_{2+3}, Sc_2 longer than Sc_1; r far out near tip of R_1; cell M_1 longer than its petiole; basal deflection of Cu_1 near mid-length of cell 1*st* M_2; indications of a spur on vein R_2 near its origin, jutting into cell 1*st* R_1 towards Sc_2.

Abdomen shiny brownish, with a violaceous subterminal ring in the male; hypopygium light chestnut-brown. Male hypopygium with each basistyle relatively stout, the mesal apical angle produced meso-caudad into a small chitinized point; mesal face of basistyle rather densely setiferous and bearing three small chitinized spines and teeth. Dististyles two, the outer larger, gradually expanded into an obtuse blackened apex, on the outer margin before the tip with a low chitinized tooth; inner style more slender, rather densely setiferous, some of the setæ conspicuous. Gonapophyses simple, slender, gently curved, narrowed to the acute apex, the distal third blackened.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Allotype, ♀, Ross, Westland, February 21, 1923 (*T. R. Harris*).

Paratypes, 1 ♂, with the allotype; 2 ♂ ♂, Mahinapau, Westland, February 24, 1923 (*T. R. Harris*); 1 ♀, Blackball, Westland, December 1916 (*J. W. Campbell*); 2 ♂ ♂, Greymouth, Coal Creek Track, Westland, February 13, 1923 (*T. R. Harris*); ♂ ♀, *in copula*, Greymouth, February 11, 1923 (*T. R. Harris*); 2 ♀ ♀, February 14, 1923.

Gynoplistia hirsuticauda, sp. n.

General coloration grey; antennæ with seventeen segments, the flagellar branches short; femora black, yellowish basally, with a subterminal pale ring; male hypopygium with the mesal margins of the basistyles densely setiferous.

Male.—Length about 10 mm.; wing about 10 mm.

Rostrum and palpi black. Antennæ brownish black, 17-segmented, the formula being 2 + 5 + 5 + 5; longest branch about twice the length of the segment bearing it; terminal branch shorter than the segment; terminal segment about one-half longer than the penultimate. Head dark grey.

Mesonotal præscutum golden brown with three darker brown stripes, the median stripe divided by a line of golden pollen; præscutal interspaces conspicuously grey; pseudosutural foveæ black; humeral region dark brown; scutum and scutellum grey, dark brown laterally; postnotum dark brown. Pleura dark-coloured, light grey pruinose. Halteres

obscure orange, the apex of the knobs infuscated. Legs with the coxæ reddish, grey-pruinose; trochanters obscure yellow; femora broadly yellow basally, broadest on the fore legs, the apical half or thereabouts black with a reddish-yellow subterminal ring, least conspicuous on the fore femora; tibiæ light brown, the tips blackened; remainder of the tarsi black; tibial spurs acutely pointed. Wings subhyaline with a brown pattern, including a large quadrate area at the origin of *Rs*, extending between veins *R* and *M*; a conspicuous seam along the cord, extending from the slightly darker stigma entirely across the wing; a seam at *m*; wing-apex broadly darkened, including all of cell M_1; veins yellow, brown in the infuscated areas. Venation: *Rs* square and spurred at origin; R_{2+3} shorter than the deflection of R_{4+5}; cell M_1 about one-half longer than its petiole.

Abdomen dark brown, the basal segments pruinose, the lateral margins broadly obscure yellow; basal sternites dark, the subterminal segments and hypopygium pale. Male hypopygium with the mesal margin of the basistyle very extensively and conspicuously clothed with long yellow setæ; apical angle of basistyle produced into a short blunt lobe. Dististyles two, the outer style terminating in a slender black point; before this, on outer face, a high crest that is produced apically into a blunt lobe; inner style more slender, the caudal margin fringed with long setæ.

Hab. New Zealand (South Island).

Holotype, ♂, Queenstown, Wakatipu district, Otago, altitude 1000 feet, January 4, 1923 (*F. S. Oliver*).

Gynoplistia dispila, sp. n.

General coloration shiny black, the head and pleura more pruinose, especially the latter; wings greyish subhyaline with two brown areas; basistyles of male hypopygium with a setiferous cushion on mesal face near base.

Male.—Length about 5–5·5 mm.; wing 5·5–6·2 mm.

Rostrum and palpi black. Antennæ 15-segmented, the formula being 2+2+8+3, with the possibility of there being an additional simple subterminal segment; scape black; basal one or two flagellar segments pale at the ends; remainder of the antenna black; flabellation of antenna of moderate length, less than one-half the length of the flagellum. Head black, indistinctly dusted with grey.

Mesonotal præscutum and scutal lobes shiny black; median area of the scutum and the scutellum and postnotum more brownish. Pleura black, almost concealed by a sparse appressed microscopic grey pubescence. Halteres pale, the

base a little brighter. Legs with the coxæ and trochanters obscure yellowish testaceous; femora obscure yellow, the tips rather broadly blackened; tibiæ and metatarsi pale brown, the tips narrowly darker; remaining tarsal segments passing into darker brown. Wings greyish subhyaline, with two brown areas, the first small to subobsolete, near the origin of *Rs*; the second extending from the stigma along the cord to the fork of *M* or beyond on to the basal deflection of Cu_1; veins dark brown. Venation: Sc_1 ending opposite or shortly before the fork of *Rs*; *Rs* strongly angulated at origin; *r* about one and one-half times its length from the tip of R_1 and near mid-length of the stigma; cell M_1 a little longer than to approximately twice as long as its petiole; basal deflection of Cu_1 about one-third its length beyond the fork of *M*.

Abdomen black, the basal sternites paler. Male hypopygium with the apical angle of the basistyle produced caudad into a moderately long setiferous lobe; mesal apical angle produced into a flattened glabrous point; mesal face setiferous, culminating in a small subglobular setiferous cushion near the base. Dististyles two, pale, subequal in length. Gonapophyses simple, each an almost straight subchitinized spine.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Paratype, ♂, Ross, Westland, February 23, 1923 (*T. R. Harris*).

Gynoplistia pygmæa, sp. n.

General coloration shiny coal-black; antennæ 15-segmented, the flabellations elongate; halteres with dark brown knobs; wings hyaline with a rather sparse brown pattern; cell M_1 present; male hypopygium with each basistyle produced apically into a lobe that is shaped somewhat like a duck's head.

Male.—Length 3·8 mm.; wing 4·3 mm.

Rostrum and palpi brownish black. Antennæ 15-segmented, the formula being 2+2+6+5; the eleventh segment is very indistinctly produced at apex; the terminal segment is narrowed at apex and apparently formed by the fusion of two segments; scape dark brown; basal two flagellar segments obscure yellow; remainder of flagellum, including all branches, brownish black; antennal flabellations elongate, the longest (segments 5 and 6) about one-half the length of the flagellum. Head shiny black.

Mesonotum shiny black. Pleura similarly coloured, with a narrow line of microscopic grey pubescence extending from the wing-root ventrad to above the mid and hind coxæ where the area broadens out. Halteres yellow, the knobs conspicuously dark brown. Legs with the coxæ and trochanters testaceous yellow; femora similar, the tips feebly dilated and conspicuously blackened; tibiæ pale brown, the tips narrowly blackened; tarsi black, the base a little paler. Wings hyaline, with a rather sparse brown pattern, including a small postarcular spot in the base of cells *R* and *M*; a square area at origin of *Rs*, with similar pale clouds in cells *M* and 1*st A* forming a broken fascia at this level; stigma brown, connecting with a conspicuous seam along the cord, this interrupted at cell 1*st* M_2 which is only narrowly seamed at the ends with darker; wing-apex pale; a tiny brown cloud at fork of M_{1+2}; veins dark brown. Venation: *Rs* elongate, arcuated at origin; *r* very faintly indicated; cell M_1 about one-half longer than its petiole; basal deflection of Cu_1 near mid-length of cell 1*st* M_2.

Abdomen black, including the hypopygium. Male hypopygium with each basistyle stout, the mesal apical angle produced into a lobe that is shaped somewhat like the head of a duck, the beak-like apex depressed, subacute. Dististyles two, the outer slender, terminating in a narrow attenuate apex; inner style broader, the apex abruptly narrowed into a short cylinder. Gonapophyses simple, elongate, gently curved, the apex with numerous weak denticles.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 21, 1923 (*T. R. Harris*).

Dolichopeza fenwicki, sp. n.

General coloration light grey, the præscutum with three conspicuous dark brown stripes, the median one split by a paler brown vitta; antennæ relatively short, the flagellum black; legs black; wings strongly tinged with brown, with three conspicuous whitish blotches on distal half; abdominal segments greyish plumbeous, the base and apex of each of the intermediate segments broadly dark brown.

Male.—Length 10 mm.; wing 10·5 mm.

Rostrum dark brown; palpi black, the terminal segment paling into brown. Antennæ relatively short, if bent backward scarcely reaching the base of the halteres; basal segment of scape brown, dusted with grey; second segment brown; flagellum black. Head light grey, the vertical tubercle paler, the occipital region darkened.

Mesonotal præscutum light grey with three very con-

spicuous dark brown stripes, the median stripe split by a narrow, paler brown vitta; the small pseudosutural foveæ surrounded by a pale brown cloud; scutum pale buffy grey, the lobes conspicuously marked with dark brown; scutellum and postnotum brownish grey, the medio-tergite of the latter narrowly margined posteriorly and laterally with dark brown. Pleura light grey, variegated with dark brown, this especially conspicuous on the sterno-pleura and meron. Halteres elongate, pale brownish yellow, the knobs dark brown, their knobs scarcely if at all paler. Legs with the coxæ pale, sparsely pruinose, more distinct on the fore coxæ; trochanters pale yellowish white; remainder of the legs brownish black throughout, the femoral bases a little paler. Wings with a strong brown suffusion; stigma large, darker brown; conspicuous whitish areas before the stigma, including parts of cells *C*, *Sc*, and *R*; near the fork of *M*, including portions of cells *R* and, especially, the base of *2nd* M_2; a third conspicuous area occupies the base of cell *2nd* R_1 beyond the stigma; veins dark brown. Venation: practically as in *D. parvicauda*, Edwards.

Abdominal segments pale greyish plumbeous, banded with dark brown, about the basal and apical third of each segment brown, the middle third or a little more being of the ground-colour; on the subterminal tergites the colour becomes more uniformly dark brown; on the subterminal sternites the apical brown band becomes obsolete. Hypopygium small, dark brown.

Hab. New Zealand (South Island).

Holotype, ♂, Glenorchy, Wakatipu district, altitude 1200 feet, January 4, 1923 (*C. C. Fenwick*).

This very distinct species of *Dolichopeza* is named in honour of the collector, Mr. Cuthbert C. Fenwick.

XXXII.—*On new Species of* Curculionidæ *from India* (*Coleoptera*). By Guy A. K. Marshall, C.M.G., D.Sc., F.R.S.

[Plate VIII.]

Subfamily *Attelabinæ*.

Attelabus lacertosus, sp. n. (Pl. VIII. fig. 5.)

♂ ♀. Head, rostrum, antennæ, prothorax, sternum, and legs shiny blue-black; elytra and venter testaceous brown to red-brown.

Head much longer than broad, as long as the pronotum, with a few fine irregular transverse striolæ in the basal half above, and with irregular and widely scattered punctures; the sides and lower surface more strongly striolate towards the base and coarsely and closely punctate anteriorly; the forehead not separated from the rostrum by a transverse impression, with a very convex smooth median costa and a short deep sulcus on each side of it, the lateral areas being coarsely punctate. *Rostrum* two-thirds the length of the head, parallel-sided in the basal half, strongly dilated in front; the dorsum rather flattened, remotely punctate and with a shallow longitudinal furrow between the antennæ. *Antennæ* with joint 2 of the funicle as long as but narrower than 1, 3 distinctly longer, the remainder gradually diminishing in length, 4 being about as long as 2, and all longer than broad except 7, which is as long as broad; the club with joint 3 as long as the other two together, 1 as long as broad, and 2 transverse. *Prothorax* transverse, widest just in front of the basal constriction, and gradually narrowed thence to the apical constriction, with a very shallow lateral sinuation in the middle; the base bisinuate, with a small emargination in the middle, the apical margin deeply sinuate; the dorsum convex, smooth, and with widely scattered punctures, the curved transverse subapical impression longitudinally striolate, the basal impression shallow, transversely striolate, with a few punctures and with a deep furrow just within the margin. *Scutellum* blue-black, trapezoidal, widest at the base, broadly truncate at the apex, with a few small setigerous punctures along each side and a faint median longitudinal impression. *Elytra* subquadrate, much wider than the prothorax, only a little longer than broad (8 : 6), not striate (except for a juxta-sutural stria), but with complete regular rows of distinct round punctures; the intervals flat and quite smooth, each with a row of minute remote pale erect setæ, and also a denser row of curved setæ on the epipleuræ. *Legs*: the front coxæ divergent apically; the front femora inflated, much thicker than the others and with an obtuse tooth close to the apex; the tibiæ compressed, with shallow longitudinally confluent punctures and a shallow furrow on each side, the front pair armed internally with a row of long stout teeth, the posterior pairs finely denticulate on the apical half only; the front tarsi with joint 2 flattened and much broader than long. *Sternum*: the metasternum transversely striolate and with sparse curved pale setæ in the middle, and with close shallow punctation and slightly denser recumbent setæ at the sides,

the episternum very closely punctate and fairly densely setose in the posterior half only.

Length 7·8–9 mm., breadth 3·6–4·2 mm.

Assam: North Manipur (*Doherty*).

Described from eight specimens.

This species belongs to Jekel's section *Paramecolabus*, which includes such species as *discolor*, Fhs., *feæ*, Fst., *humerosus*, Fst., *obliquus*, Hllr., etc., but its characteristic coloration will distinguish it readily from all the other species of the group except the following.

Attelabus simulatus, sp. n.

♂ ♀. Coloration precisely similar to that of *A. lacertosus*, sp. n., from which this species differs in the following characters:—

Head distinctly tumid at the base; the forehead not costate in the middle and with two comparatively shallow sulci on each side. *Rostrum* less strongly dilated at the apex. *Antennæ* with joint 5 of the funicle as long as broad, 6 and 7 transverse. *Prothorax* more transverse, much more abruptly constricted at the base and apex, the dilatation just in front of the basal constriction being far more prominent; the anterior transverse impression not longitudinally striolate, and the basal one very deep; the disk bearing two large foveæ, and with much finer and more sparse punctures. *Scutellum* without any median impression. *Elytra* only slightly wider than the prothorax, much narrower in relation to the length (8 : 5); the intervals feebly rugulose. *Legs* rather longer and more slender, especially the front tibiæ of the ♂; the femora with a sharp tooth; the tibiæ finely aciculate, scarcely punctate or sulcate, the teeth on the front pair much smaller and more numerous; joint 2 of the front tarsi about as long as broad. *Sternum* very sparsely setose at the sides of the metasternum.

Length 6–9 mm., breadth 2·4–3·6 mm.

Sikkim: Darjiling.

Described from twenty specimens.

Subfamily *Otiorrhynchinæ*.

Phytoscaphus fractivirgatus, sp. n. (Pl. VIII. fig. 1.)

♂ ♀. Integument red-brown, striped above with dark brown and pale green scaling; the head and rostrum with pinkish-buff scaling having a slight coppery reflexion; the prothorax pale green, with three broad dorsal brown stripes,

the median one being pointed at the the apex, and on the pleuræ a narrower brown stripe running from the base to beyond the middle ; the elytra with the whole of interval 1, the basal fifth of interval 3, the whole of interval 5 except the basal fifth, the apex of interval 6, the whole of interval 7, the basal fourth and the apex of intervals 8 and 9, the apex and a small median pitch on interval 10, and the whole of the external margin pale green, the remainder dark brown ; the legs pale pinkish buff ; and the lower surface pale greenish. Occasionally the green markings on the elytra are more developed, and in one extreme specimen the whole side of the elytra is green beyond stria 4, except the basal half of intervals 6 and 10, also the base of 2, the whole of 3, and the apex of 4.

Head with a deep frontal stria, the forehead flattened, not broader than the space between the dorsal carinæ of the rostrum. *Rostrum* with the narrow dorsal area slightly convex in the basal half and usually having there a faint median carina, the lateral ones being indefinite but becoming distinct on the anterior half, which is shallowly sulcate ; the interantennal area deeply bifoveate, and without lateral processes in the ♂ ; the lateral area with a broad smooth bare costa running from the scrobe straight to the eye and a deep stria above and below it; the lower surface with a stout median tooth. *Antennæ* densely clothed with narrow pale scales, the scape with short recumbent setæ ; the funicle with joints 1 and 2 equal, 3–6 slightly diminishing progressively in length and all longer than broad, 7 as long as 4. *Prothorax* broader than long (9 : 7), moderately rounded at the sides, widest rather behind the middle, and shallowly constricted in front ; the basal margin gently bisinuate, the apex truncate dorsally, with the ocular lobes strongly developed and with distinct vibrissæ; the dorsum convex longitudinally, rather coarsely and closely punctate (mostly concealed by the scaling) and with small granules on the interspaces, each bearing a short subrecumbent spatulate seta ; the green scales subcircular and much larger than the brown ones. *Scutellum* trapezoidal, broadest behind and sparsely squamose. *Elytra* oblong-ovate, parallel-sided from the shoulders to beyond the middle in the ♂, slightly widened behind the middle in the ♀, jointly sinuate in the middle at the base, the apices separately rounded ; the deeply punctate striæ clearly visible through the scaling and scarcely shallower behind, stria 9 bearing a deep fovea on a level with the hind coxa ; the intervals slightly convex, with rows of erect flattened pale setæ, each arising from a small

granule : the scale rather convex and closely overlapping. *Legs* with an obtuse angulation on the inner edge of the front tibiæ in both sexes, the apical tibial bristles red-brown, there being a double row on the outer edge of the hind corbels.

Length 6–6·5 mm., breadth 2·5–2·9 mm.

Assam : Chandkhira, Sylhet (*J. L. Sherwill*, type) ; Gauhati, iv.–v. 1918 (*T. B. Fletcher*).

Described from ten specimens.

A strikingly coloured species, most nearly allied to *P. alternans*, Fst., which may, however, be at once distinguished by the absence of the fovea in stria 9 and by its broader forehead, which is much wider than the dorsal area of the rostrum.

Phytoscaphus tenuirostris, sp. n.

♂ ♀. Integument testaceous to red-brown, densely clothed above and below with pale greenish scales.

Head densely squamose, with a very fine frontal stria visible through the scaling ; a row of three or four suberect spatulate setæ along the inner edge of each eye ; the forehead about as broad as an eye. *Rostrum* comparatively slender, as long as the front tibia ; the dorsal area flat, as wide as the forehead at the base and gradually narrowing in front, very finely tricarinate, the carinæ almost completely hidden by the scaling, and with curved spatulate raised setæ ; the interantennal area flattened, not excavated, and without lateral projections in the ♂ ; the lateral areas with their usual two striæ shallow and indistinct ; the lower surface distinctly curved and without any trace of a median tooth or transverse basal furrow. *Antennæ* slender, the scape clothed with narrow hair-like scales ; the funicle with joint 1 as long as 2+3, 2 nearly twice as long as 3, 3–6 subequal and about as long as broad, 7 a little longer ; the club as long as the four preceding joints. *Prothorax* as long as broad (♂) or a little broader than long (♀), rounded at the sides, broadest behind the middle, feebly arcuate at the base, truncate dorsally at the apex, the post-ocular lobes but little developed and with short vibrissæ ; the dorsum very slightly convex longitudinally and when abraded, with a finely aciculate patch in the middle of the basal half and shiny elsewhere, with remote setigerous punctures throughout and a small lateral fovea on each side behind the middle, all these characters being entirely hidden by the scaling ; the setæ rather broad, short, and suberect.

Scutellum small, nearly circular, squamose. *Elytra* oblong-ovate, with the shoulders very prominent and rounded rectangular, almost parallel-sided from there to beyond the middle in the ♂, widened behind the middle in the ♀, jointly rounded at the apex ; the striæ closely and distinctly punctate, but the punctures almost entirely concealed by the scaling, stria 9 with a large deep fovea at one-third from the base in the ♀ only, the intervals (when not abraded) almost flat, except interval 1 which is somewhat raised in the posterior half, and each bearing a single row of short curved spatulate setæ ; the scales almost circular, dense, and slightly overlapping. *Legs* testaceous, densely squamose ; the front tibiæ not bisinuate internally in the ♂.

Length 2·75–3 mm., breadth 1·2–1·3 mm.

N.W. Frontier Province : Taru, Peshawar District, on sugar-cane, x. 1914 (*T. B. Fletcher*, type). Bihar : Pusa, viii. 1920 (*Haq*). Bombay : Dohad, on maize, viii. 1917 (*T. B. Fletcher*).

Described from twenty-four specimens.

The only other described species of *Phytoscaphus* that exhibits the following combined characters—rostrum without a median tooth or transverse basal furrow beneath, hind tibiæ with only a single row of setæ on the outer margin of corbel, and the front tibiæ not bisinuate internally—is *P. parilis*, Fst., which differs from the present species, *inter alia*, in having a comparatively short and broad rostrum and the two basal joints of the funicle equal.

Subfamily *Cleoninæ*.

Genus Lixocleonus, nov.

Head with the eyes broadly ovate, oblique. *Rostrum* almost cylindrical, not angulate laterally and not broader at the base than the forehead, the apical margin somewhat produced and sinuate in the middle; the scrobe with its upper edge distinctly angulate close to the base. *Antennæ* with joint 1 of the funicle much longer than 2, and joint 7 annexed to the club. *Prothorax* gently rounded at the base, without postocular lobes, but with well-developed vibrissæ. *Scutellum* invisible. *Elytra* narrowly cylindrical, only slightly broader than the prothorax, the clothing consisting of hairs only. *Legs* with the femora unarmed ; the lower surface of the tarsi with only a very narrow line of spongy setæ at the side of each joint, joint 2 of the hind pair as long as 3 ; the claws connate at the base and each

with a minute basal lateral seta. *Sternum*: the metasternum much longer than the median coxæ. *Venter* closely and minutely punctate, with scattered larger punctures, which show through the clothing as irregular black spots; the first ventral suture sinuate in the middle.

Genotype, *Lixocleonus incanus*, sp. n.

The species for which this genus is proposed runs down to the American genus *Cleonidius*, Casey, in Faust's key to the subfamily (Deut. ent. Zeitschr. 1904, p. 190), but the latter differs in having the head separated from the rostrum by a transverse impression, the upper edge of the scrobe is not angulate near the base, joint 7 of the funicle is not annexed to the club, and the prothorax has well-developed postocular lobes and its base deeply bisinuate.

The general facies of *Lixocleonus* is very similar to that of the narrowly cylindrical species of *Lixus*, but these may be distinguished by the fact that the forehead is narrower than the base of the rostrum, and that the lower surface of the tarsi is densely clothed throughout with spongy pubescence.

Hitherto no satisfactory character has been given for distinguishing the Lixini from the Cleonini, but the width of the forehead appears to afford quite a reliable distinction, this being as broad as or broader than the base of the rostrum in the Cleonini and narrower in the Lixini. It would, however, then be necessary to remove a few Palæarctic species from the genus *Lixus*, such as *L. vibex*, Pall. (subg. *Lixestus*, Reitt.), subgenus *Phillixus*, Petri, and *L. anguinus*, L., which would appear to be more naturally placed in *Cleonidius*.

Lixocleonus incanus, sp. n. (Pl. VIII. fig. 2.)

♂ ♀. Integument black, rather thinly and evenly clothed above with short recumbent grey setæ; the prothorax with a paler lateral stripe on each side formed of rather denser setæ, with a very indefinite darker stripe on each side of it; the elytra with a small whitish spot at the bases of interval 2, stria 3, and the shoulder, and some very indefinite whitish dots along the outer striæ formed of a few setæ that are whiter than the others; the lower surface with much longer and denser grey setæ, irrorated with darker spots due to the smooth black rings round the larger punctures.

Head very closely punctate; the rostral carina encroaching somewhat on the forehead. *Rostrum* about three-fourths

the length of the pronotum, closely and confluently punctate throughout, with a strong median carina extending from the base to slightly beyond the antennæ and a shallow furrow on each side of it. *Antennæ* piceous, with the scape red-brown at the base and along its posterior half, fairly densely clothed with grey setæ; the funicle with joint 2 a little longer than 3, 3–6 short and strongly transverse. *Prothorax* broader than long (22 : 17), almost parallel-sided from the base to far beyond the middle, then rather abruptly narrowed to the apex; the dorsum very closely and finely punctate and with numerous separated large punctures, a very feeble median carina on the anterior half and a small shallow impression in the middle of the base. *Elytra* narrowly elongate, parallel-sided from the shoulders to far beyond the middle, shallowly sinuate jointly at the base and separately rounded at the apex, with very feeble impressions behind the scutellum (sometimes obsolete) and just within the shoulders; the striæ very shallow, with rather elongate separated punctures, the intervals flat and finely rugulose, without any posterior callus. *Legs* black, with the tarsi piceous, fairly densely clothed with long recumbent grey setæ; the fringe of spines at the apex of the tibiæ testaceous.

Length 7·25–9 mm., breadth 2·3–2·9 mm.

Bihar: Pusa.

Described from forty-four specimens.

The larvæ have been found feeding on the roots of *Lannea asplenifolia*, on which they form elongate earthy cocoons. The adults have been observed on grasses, sugar, maize, and cotton, but there is no indication that they do any damage.

Subfamily *Erirrhininæ*.

Smicronyx cuscutæ, sp. n.

♂ ♀. Integument black, clothed above with cinnamon-brown scales variegated with whitish ones; the lower surface with uniform greyish-brown scaling.

Head with the vertex finely shagreened and bare, the forehead squamose. *Rostrum* slightly longer than the head and pronotum, distinctly curved, very finely shagreened and with five fine indistinct carinæ, which extend to the antennæ (♀) or nearly to the apex (♂), the median one being flattened and broadened between the antennæ; the basal half squamose, the scales forming a small tuft on each at the base. *Antennæ* black; the funicle with joint 1 as

long as 2–4 together, 2–7 transverse, 2 not longer than 3. *Prothorax* broader than long (6 : 5), moderately rounded at the sides, widest at the middle, and constricted near the apex ; the basal margin shallowly bisinuate, much broader than the apex, which is truncate dorsally, the postocular lobes being small ; the dorsum with very shallow, more or less confluent punctures throughout, which are almost completely hidden by the relatively large scales. *Scutellum* punctiform. *Elytra* oblong-ovate, with prominent and roundly rectangular shoulders, almost parallel-sided from the shoulders to beyond the middle ; the fine, indistinctly punctate striæ narrowly visible through the scaling ; the intervals flat and smooth, each with two irregular rows of large, partly overlapping scales and a single row of recumbent scale-like setæ. *Legs* black, densely squamose ; the femora with a minute tooth.

Length 2·4 mm., breadth 1·2 mm.

Bihar : Pusa, iii. 1921 (*Rangi*).

Described from sixteen specimens, all bred from larvæ living in galls on the stems of *Cuscuta reflexa*.

Of the previously described Indian species the most similar is *S. albovariegatus*, Fst. (1891), which differs in having the prothorax strongly punctate and with white scaling at the sides and along the median line ; the legs and antennæ are red-brown ; and the scales on the elytra are elongate and narrowed at both ends.

A much closer ally is *S. tataricus*, Fst. (1886), from Russian Turkestan, which has the elytra distinctly narrower in proportion to their length and bearing many more white scales, these being almost as numerous as the brown, and the median carina on the rostrum is not flattened and dilated between the antennæ.

Genus Hedychrous, nov.

Head separated from the rostrum above by a shallow transverse impression ; the eyes entirely contiguous beneath. *Rostrum* long and slender, flattened dorso-ventrally towards the apex, the lower surface somewhat flattened and deeply notched at the base (as seen from the side) ; the scrobes confluent beneath the rostrum ; the peduncle of the submentum large and subtriangular, the mentum minute and strongly transverse. *Antennæ* inserted at (♀) or beyond (♂) the middle of the rostrum ; the scape strongly clavate, not reaching the eye ; the funicle with joint 1 longer than 2, and 7 not annexed to the club, which is elliptical and

3-jointed. *Prothorax* with well-developed postocular lobes. *Scutellum* minute. *Elytra* with prominent shoulders; stria 10 abbreviated. *Legs* without a trochanteral seta; the femora strongly clavate and with a large sharp tooth; the tibiæ not dilated at the apex, the inner margin distinctly bisinuate and with a sharp angle at one-third from the base, the external apical angle rounded off, and just within the apical fringe of setæ on the hind pair a narrow carina, of which the long sharp uncus is a continuation, the latter partly concealed by a dense tuft of setæ arising from near the apex of the inner edge; the tarsi densely spongy beneath, with the third joint broadly lobate, the claws rather short, stout, connate at the base, and without a basal seta. *Sternum*: the prosternum with a broad shallow impression in front of the coxæ, somewhat tumid behind the coxæ and with a distinct median furrow; the metasternum with a deep fold in front of each hind coxa. *Venter* with the intercoxal process broadly rounded and rather narrower than a coxa; ventrite 2 (4) a little longer than the next two together and fused with 1 (3) in the middle.

Genotype, *Hedychrous rufofasciatus*, sp. n.

Closely allied to *Smicronyx*, Schh., but in that genus the eyes are not contiguous, and the tibiæ are produced externally at the apex and are not angulate on the internal edge.

Hedychrous rufofasciatus, sp. n. (Pl. VIII. fig. 6.)

♂ ♀. Integument black, with a well-marked pattern composed of black scales (often with a peacock-blue reflection) and orange-red scales (occasionally varying to orange-yellow or deep red); the head and rostrum bare; the prothorax orange-red, with the basal margin whitish, a large oval black patch in the middle of the disk that nearly reaches both base and apex, and a smaller, nearly circular, black patch on each side, the black markings often surrounded by a narrow whitish ring; the elytra with black scaling, the margins and two broad transverse bands orange-red; the anterior band situated in front of the middle, its posterior margin sinuate on the disk, its front margin triangularly produced to the base along the suture, the apex of the triangle being on the scutellum, and a red stripe running along interval 7 from the band to the base; the posterior band a little behind the middle and narrowly connected along the suture with the other band, its front margin quite

straight, and a red stripe on interval 1 connecting it posteriorly with the apex; the red marginal stripe extending inwards only to stria 9 in front of the posterior band but reaching stria 7 behind it; the lower surface with whitish or grey scaling, except the last three ventrites, which are entirely black, and a large black lateral patch on the metasternum and on each of the two basal ventrites.

Head finely aciculate and with scattered shallow punctures. *Rostrum* longer than the head and pronotum (19 : 13) and of about the same length in the two sexes; in the ♂, parallel-sided, strongly and closely punctate throughout, and with a faint median carina in the basal two-thirds; in the ♀, the apical half shiny and with sparse minute punctures, and the median carina evanescent. *Antennæ* with joint 1 of the funicle equal to 2+3, 3 and 4 subequal and about as long as broad, 5 and 6 slightly transverse and equal, 7 similar but a little larger. *Prothorax* transverse (4 : 3), strongly rounded at the sides, broadest slightly behind the middle, much narrowed in front; the apical margin subtruncate dorsally, the base slightly rounded or feebly bisinuate; the dorsum very closely and evenly punctate (the punctures concealed by the scaling), and without any median furrow or carina. *Elytra* ovate, jointly and shallowly sinuate at the base, and jointly rounded at the apex; the rows of fine elongate punctures feebly striate, but the striæ deceptively emphasised by the arrangement of the black scales; the scales oblong, densely overlapping, there being six or seven across an interval in the middle of the disk; no trace of any setæ. *Legs* black, not very densely clothed with grey scales; the apical fringe of setæ on the tibiæ black, the internal apical tuft reddish; the punctures coarse, shallow, and subconfluent, except on the clavate portion of the femora, where they are much smaller and separated.

Length 4·2–6 mm., breadth 2–2·7 mm.

Bihar: Pusa, vii. 1916 (*T. B. Fletcher*, type), xi. 1919 (*Haq*). Bengal: Calcutta (*N. Annandale*).

Described from twenty specimens.

This very striking species is recorded as having been found on various plants, such as jute, ginger, rice, and sweet potato, but there is no information as to its doing any damage.

Subfamily *Balaninin*æ.

Balaninus nigricollis, sp. n. (Pl. VIII. fig. 4.)

♂. Integument dull black, densely clothed with fulvous scaling above and below, except the following parts which

are bare and black : the head, rostrum, the entire pronotum (the upper edge of the inferior squamose area quite sharply defined), an ovate humeral patch on the elytra reaching the lateral margin broadly, extending backwards for 1·2–1·5 mm. on intervals 7 and 8 and narrowly along the base to stria 4, and a median wedge-shaped area on the last visible ventrite (♂); the outer part of the black humeral patch with a few whitish scales; the legs thinly clothed with grey setiform scales.

Head closely and strongly punctate, with a minute frontal fovea and a median frontal carina continuous with that on the rostrum, the latter arising (in lateral view) from the middle of the eye. *Rostrum* nearly twice as long as the head and prothorax, moderately curved, strongly punctate in rows at the base, with a smooth median line and a punctate furrow just above the scrobe, the latter passing beneath the rostrum at the base. *Antennæ* inserted a little behind the middle of the rostrum, with the scape not quite reaching the eye; the funicle with joint 1 as long as 2–4 together, 2–6 progressively diminishing in length, 7 as long as 4 but broader; the club rather longer than the five preceding joints together, its first joint equal to the second. *Prothorax* about as long as its basal width, broadest at the base, very slightly rounded at the sides, and scarcely constricted at the apex; the apical margin truncate dorsally and sloping obliquely forward at the sides; the median basal process sinuate; the dorsum with close shallow reticulate punctures, tending to coalesce into oblique curved striæ, and with a very variable abbreviated narrow smooth median line. *Scutellum* small, oval, longer than broad, with dense pale scaling. *Elytra* cordiform, with the apices jointly rounded and the lateral margins not sinuate; the striæ broad and deep at the base, but rapidly becoming narrower and shallower behind; the sutural impression asymmetrical, very deep at the base and becoming shallower posteriorly towards the apex, starting on interval 1 of the left elytron but soon passing over to interval 1 of the right elytron, which is distinctly broader than the other interval 1 in the apical half; the intervals otherwise flat and transversely rugulose, the narrowly triangular scales not entirely concealing the integument, there being four (sometimes five) across each interval on the disk; the suture with a fringe of obliquely raised interlocking setæ at the apex. *Legs* elongate, slender, with longitudinally confluent punctures; the femora with a large sharp tooth, compressed at its base, the hind pair exceeding the apex of the elytra. *Venter*: the anal ventrite

(♂) with a broad bare depression down the middle bearing a fringe of long pale setæ at the apex : the pygidium with a deep transverse impression.

Length 5·25–5·7 mm., breadth 2·5–2·8 mm.

Burma : Lashio. iv. 1918, on *Ficus* (*Y. Ramachandra Rao*).

Described from eight specimens.

Its characteristic colouring distinguishes this species from any other Oriental *Balaninus* known to me.

Subfamily *Cryptorrhynchinæ*.

Cyphomydica quadrifloccosa, sp. n. (Pl. VIII. fig. 3.)

♂. Integument shiny black, densely clothed with earth-brown scaling and with a short stripe of dark brown scales at the base of the suture.

Head entirely concealed from above, closely and strongly punctate throughout, with a very shallow median impression on the vertex, but the sculpturing entirely hidden by the squamose indumentum, and set with scattered short erect inflated scales. *Rostrum* about as long as the pronotum, gently curved, parallel-sided from the base to near the apex and there slightly dilated, reticulately punctate throughout, but the punctures entirely hidden by the indumentum, and set with numerous erect inflated scales. *Antennæ* testaceous brown to piceous; the funicle with joint 1 about as long as but thicker than 2, 3–5 equal and slightly longer than broad, 6 a little longer, 7 a little longer and broader than 6. *Prothorax* transverse (15 : 11), parallel-sided from the base nearly to the middle, then rapidly narrowed to near the apex, the sides being straight; the base shallowly bisinuate, the apex arcuately produced dorsally, the postocular lobes small but distinct; the dorsum elevated in the middle and with a broad deep smooth median furrow which reaches from the base almost to the apex, the ridges on each side of it bearing at the middle a small clump of erect striolate club-shaped scales set in a hollow and a much larger clump on each side at the apex; the lateral areas depressed and rather uneven, the extreme lateral margin with a fovea at the angulation containing several erect club-shaped scales, and a similar fovea just behind it: the general surface for the most part smooth owing to the dense indumentum, which when clean seems to have a somewhat fibrous texture, and when it is removed the surface is shiny and closely and deeply punctate. *Scutellum* small, punctiform, not elevated. *Elytra* jointly trisinuate at the base, broadest behind the middle, then very abruptly narrowed, the apex being broadly rounded; the

dorsal outline rising steeply from the base, then almost flat to a little beyond the middle, and the posterior part forming a straight slope to the apex of about 60°, the declivity being flattened dorsally; the rows of large deep punctures almost entirely hidden by the indumentum; interval 3 with a large group of long broad erect scales not far from the base, another much smaller group at about the middle, and two very small tufts of short scales on the declivity; interval 5 with five tufts of scales, which diminish behind; interval 7, which forms the dorso-lateral margin, with two slight angulations before the middle, each bearing a small tuft of short setæ and one longer one, and behind the middle an elongate and more prominent tuft: the apical margin with a fringe of broad erect scales. *Legs* with dense honeycomb scaling and numerous short erect scales; the femora with two indefinite, dark brown patches and a small sharp tooth; the tibiæ strongly bent near the base, and there rather widened dorsally and with a dark brown patch.

Length 3·45 mm., breadth 1·8–2·4 mm.

Madras: Nilgiri Hills (*A. K. Weld Downing*).

Described from six specimens.

The only other species of the genus that has been described, *C. megacalles*, Heller (Stett. ent. Zeitschr. 1908, p. 175), is a much larger insect (7 mm. long); the median discal area is not elevated on the posterior half of the pronotum and there is no median furrow; the scutellum is markedly elevated; on the elytra there is no dark stripe at the base of interval 1, but only a rounded spot near the base of interval 2; the two tufts on interval 3 unite to form a continuous compressed ridge of upright scales, the scales themselves being much broader; and the legs have no dark brown patches.

Genus Plococerus, nov.

Head with the forehead as broad as the base of the rostrum and forming a continuous curve with it; the eyes very nearly as widely separated beneath as above. *Rostrum* gently curved, with the scrobes lateral, the antennæ inserted at the middle (♀) or at one-third from the apex (♂); the mentum punctiform, the submentum elongate, narrow, and parallel-sided; the mandibles tridentate. *Antennæ* elongate; the scape very slender, abruptly clavate and not quite reaching the eye; the funicle 7-jointed, with a fringe of very long hairs on the inner side in the ♂ only; the club narrowly elliptical, somewhat compressed, the basal half of the inner side set with long hairs in the ♂. *Prothorax* strongly

transverse, the base with a median angle and subtruncate on each side of it, much narrowed in front, with well-developed rectangular postocular lobes. *Scutellum* distinct, transverse. *Elytra* with the shoulders only moderately prominent and obliquely rounded, deeply punctato-striate, the apices jointly rounded, the interlocking sutural flanges continued right to the apex. *Legs* approximately equal in length ; the femora not very narrow at the base, moderately clavate, each with a short stout tooth, and not sulcate beneath ; the tibiæ compressed, curved at the base, narrowly carinate on the upper and lower edges, with a bifid tuft at the inner apical angle, two oblique rows of bristles towards the apex of the two posterior pairs, and a longitudinal patch of bristles on the posterior face of all the tibiæ just below the tarsi ; the tarsal claws comparatively small and slender, simple, and without any basal lateral seta. *Sternum* : the pectoral canal forming a deep narrow gutter, bounded behind by the mesosternum, forms the whole of the furrow behind the front coxæ and is continued for some distance behind the median coxæ, the apical portion of the furrow not overhung but sloping ; the mesepisterna much smaller than the mesepimera, very narrow, and lying almost transversely ; the metasternum as long as the median coxæ, the metepimera concealed. *Venter* with the intercoxal process broadly rounded, narrower than the coxæ ; the first ventral suture deep and straight ; the three intermediate ventrites equal in length. *Stridulatory apparatus* as in *Cryptorrhynchus lapathi*, L. ; in the ♂ the files are on the lower surface of the elytra at the apex of the sutural margin, the scrapers being two minute short transverse ridges at the apex of the 7th tergite ; whereas in the ♀ the files consist of a large striolate patch on each side of the 7th tergite.

Genotype, *Plococerus denticollis*, sp. n.

A distinctive genus, which is perhaps most nearly allied to *Cyamobolus*, Schh. ; but in the latter the mesosternal portion of the pectoral canal is much shorter and scarcely reaches the middle of the median coxæ ; the mesepisterna are broad and strongly oblique ; the first ventral suture is deep at the sides and almost fused in the middle ; ventrite 2 (4) is about as long as the next two together, etc.

Plococerus denticollis, sp. n. (Pl. VIII. fig. 8.)

♂ ♀ . Integument black, with somewhat variegated greyish-brown scaling above and below, the scales not entirely concealing the tegument.

Head reticulately punctate, without any frontal fovea, but with a shallow furrow along the hind margin of the eye that is partly concealed by scaling. *Rostrum* of about the same length in the two sexes, subcylindrical, but wider at the base; in the ♂, rather strongly and closely punctate throughout and with a low narrow median carina; the ♀ with the apical half finely and sparsely punctate. *Antennæ* devoid of scaling; the funicle with joint 2 half as long again as 1, 3 almost or quite as long as 1, the remainder becoming progressively shorter, 4 and 5 longer than broad, 6 and 7 bead-like and transverse; the club with the articulations mainly obsolete; in the ♂ the setæ on joints 2–7 of the funicle and on the base of the club are prolonged into a long fringe on the inner face only, those of the ♀ being quite normal. *Prothorax* almost parallel-sided from the base to about the middle and there abruptly narrowed, thus forming a distinct angle in the ♀, which in the ♂ is produced into a sharp forwardly-projecting tooth; the dorsum deeply and reticulately punctate throughout, with a low narrow median carina, which is continued on to the median basal angle; the scales narrow and elongate, there being one to each puncture, and those on the disk all lying transversely. *Scutellum* rhomboidal, shallowly punctate, and sparsely squamose. *Elytra* oblong-ovate, very gently rounded at the sides and constricted close to the apex; the basal margin jointly trisinuate, with the external angles projecting slightly forward, the apices not quite symmetrical owing to the suture there curving to the right; the striæ deep and coarsely punctate, the intervals costate and closely punctate, the alternate ones slightly higher, especially behind, but interval 1 markedly flattened in the basal half; the striæ and intervals clothed with short oblong scales (much smaller than those on the thorax), but without setæ, each puncture containing a single recumbent scale. *Legs* rather thinly squamose and with longitudinally confluent punctures, thus appearing striate in parts; the femoral tooth rather obtuse; the uncus of the tibiæ almost longitudinal in direction and forming a low curve with the dorsal edge, the inner apical angle acute. *Sternum* and *venter* with coarse reticulate punctures, each containing a large scale; the venter scarcly differing in the two sexes.

Length 9–10·5 mm., breadth 4·5–5·25 mm.

Bihar: Pusa, v. 1907.

Described from eighteen specimens, all of which were found boring in the stems of a species of *Euphorbia*. The male of this species should be very easily recognisable on account of its plumose antennæ and dentate prothorax.

Subfamily *Isorrhynchinæ*.

Lobotrachelus urenæ, sp. n.

♂ ♀. The upper surface of the head and prothorax and the elytra black, with black setæ or scales, except for a diamond-shaped patch of densely overlapping, ribbon-like, white scales in the middle of the base of the pronotum, and a faint common arcuate band on the elytra a little behind the scutellum formed of rather sparse recumbent whitish setæ and extending only to interval 3, there being also a few whitish setæ on the basal half of the lateral margin, and sometimes too at the base of intervals 3 and 5 ; the whole of the lower surface, the forehead, and (in the ♂ only) the upper surface of the rostrum clothed with dense silvery-white scales, occasionally with a tinge of pale yellow on the sides of the sternum; the extreme apical margin of the elytra red-brown.

Head shining and very shallowly punctate on the vertex, more coarsely so at the sides. *Rostrum* straight; in the ♂, as long as the front femur and with a sharp median carina, the sculpture hidden by the scaling ; in the ♀, a little longer and more slender, and forming a less wide angle with the forehead than in the ♂, bare, finely punctate, and not carinate. *Antennæ* testaceous ; joint 1 of the funicle as long as the next two together, joints 3–6 a little longer than broad, 7 as long as broad. *Prothorax* (including the median basal lobe) a little shorter than its basal width (9 : 10), subconical, with the sides almost straight; the dorsum closely set with shallow umbilicate punctures, each containing a recumbent black seta, leaving a narrow smooth median line, the punctures becoming closer and deeper towards the middle of the base ; the median basal lobe carinate, the carina being concealed but making the patch of white scales appear tectiform ; the dorsal edge of the lateral white scaling straight and about on a level with stria 7 of the elytra. *Elytra* of the normal shape, with deep, indistinctly punctate striæ, which became shallower behind ; the intervals finely rugulose (except the small shiny patch on the shoulder) and set with broad curved black setæ, the odd intervals bearing three rows of setæ in the middle of the disk, the even intervals two. *Legs* black, the tarsi piceous ; the femora subsulcate, and rather thinly clothed with narrow oblong setæ running almost in lines. *Sternum* and *venter* with the scales ribbon-like.

Length 2–2·4 mm., breadth 1·2–1·5 mm.

Bihar: Pusa, vii. 1922 (*Haq*).

Described from twenty-two specimens which were bred from larvæ boring in stems of *Urena lobata*.

Very closely allied to *L. subfasciatus*, Mot. (sec. Faust), which is a rather larger insect (3 × 1·75 mm.), with the sides of the prothorax gently rounded and all the dark setæ on the pronotum and elytra brown instead of black; the median basal lobe of the pronotum is not carinate, so that the scales on it lie quite flat; the vertex of the head opaque and not shiny; and the scales on the rostrum of the ♂ are much narrower than those on the prosternum, so that the integument is mostly visible, whereas in the new species the scales are quite as broad as those on the prosternum and the median carina is higher.

The description of *L. argenteus*, Mot., would apply to both these species, except that the antennæ are stated to be black.

Lobotrachelus postoculatus, sp. n. (Pl. VIII. fig. 7.)

♂ ♀. Integument shiny black, with markings formed of ivory-white or yellowish-white scales; the prothorax with a transverse pale band at the apex and at the base; the elytra with a broad basal band formed of short stripes of pale setiform scales on the intervals, which diminish rapidly in length from the suture to the shoulder, and the apical half covered with similar scales, except for a large ovate black patch on the posterior declivity of each elytron lying between striæ 1 and 6; the pale scales on interval 10 do not extend so far back as on the others and are often confined to the apical fourth, whereas those on interval 9 extend to within a fourth of the base; the front of the prosternum and the side-pieces of the meso- and metasternum clothed with long narrow simple scales, but the rest of the meso- and metasternum and the whole of the venter with highly plumose pale scales, those in the middle of the sternum bearing much longer fringes in the ♂ than in the ♀.

Head shiny, with shallow confluent punctures, which are more sparse in the middle of the vertex; the forehead with a bare smooth median stripe and a row of pale setæ on each side. *Rostrum* with sparse pale setæ throughout in ♂, these being confined to the base and sides in ♀; the dorsum tectiform in ♂ with coarse confluent punctures and a sharp median carina, the punctures finer in ♀ and the apical part rather flatter. *Antennæ* testaceous; the funicle with joint 1 as long as 2 + 3, 4 as long as 3 and longer than broad, 5–7

bead-like, transverse, and progressively widening. *Prothorax* a little shorter than its basal width, subconical, with the sides quite straight; the dorsum with the bare part very shiny, rather closely set with small separated transverse punctures and with a very indefinite median impunctate line; the long narrow scales of the anterior fascia all transverse, also the more median ones of the basal fascia, the lateral one lying longitudinally, very dense and slightly overlapping the base of the elytra; the median basal lobe not carinate. *Elytra* with deep, feebly punctate striæ which become somewhat shallower behind; the intervals on the dark areas with very shallow punctures bearing fine, closely appressed, brownish-black setæ, there being four or five across each interval in the middle of the disk. *Legs* black, with the tarsi red-brown; the femora subsulcate on the external face, fairly densely covered with fine recumbent white setæ, turning to blackish near the apex.

Length 3·6–4·2 mm., breadth 1·9–2·25 mm.

Sikkim: Lebong, 5000 feet, ix. 1908 (*H. M. Lefroy*, type); Gangtok, 6150 feet, ix. 1909; Kurseong, 4700–5000 feet, vi. 1910 (*N. Annandale*).

Described from fourteen specimens.

Subfamily *Baridinæ*.

Baris cordiæ, sp. n. (Pl. VIII. fig. 9.)

♂ ♀. Integument black, rather thinly clothed above and below with elongate sandy-grey scales, more or less intermingled above with brownish scales, which sometimes form an indefinite narrow median stripe on the pronotum.

Head with close reticulate punctures throughout. *Rostrum* not bent at the base but regularly curved, almost parallel-sided, but very slightly widened at the insertion of the antennæ, gradually diminishing in depth from the middle to the apex, with shallow reticulate punctation throughout, except on a shining narrow transverse band at the extreme base, and without any carinæ, the basal half clothed with transverse scales. *Antennæ* piceous, unusually short, the scape reaching little more than halfway to the eye; the funicle distinctly widening outwardly, joint 1 short, but longer than 2, 3–7 transverse, 2 only slightly longer than 3, and 7 more than twice as broad as long. *Prothorax* about as long as broad, widest at the base, very gradually narrowing to beyond the middle, then more rapidly so, and shallowly constricted at the apex; the dorsum closely and reticulately punctate throughout, with a very faintly indicated

median ridge. *Scutellum* strongly transverse, punctate, and squamose. *Elytra* oblong-ovate, distinctly broader at the shoulders than at the prothorax, almost parallel-sided from the shoulders to beyond the middle, with deep striæ containing shallow separated punctures, the intervals flat and each with two very irregular rows of small shallow punctures (hidden by scaling), without any posterior callus; the scales elongate, spatulate, and not entirely concealing the integument. *Legs* black, confluently punctate; the femora rather densely squamose and quite linear; the front tibia sinuate dorsally; the tarsi with joint 2 not wider than 1.

Length 4·25–4·5 mm., breadth 1·8 mm.

Bihar: Pusa, larvæ boring in fruits of *Cordia myxa*, vi. 1920 (*Rangi*).

Described from fifteen specimens.

This insect may be distinguished from any of the species of the genus previously described from India by the abnormally short scape of the antennæ and by its uniform dingy scaling.

EXPLANATION OF PLATE VIII.

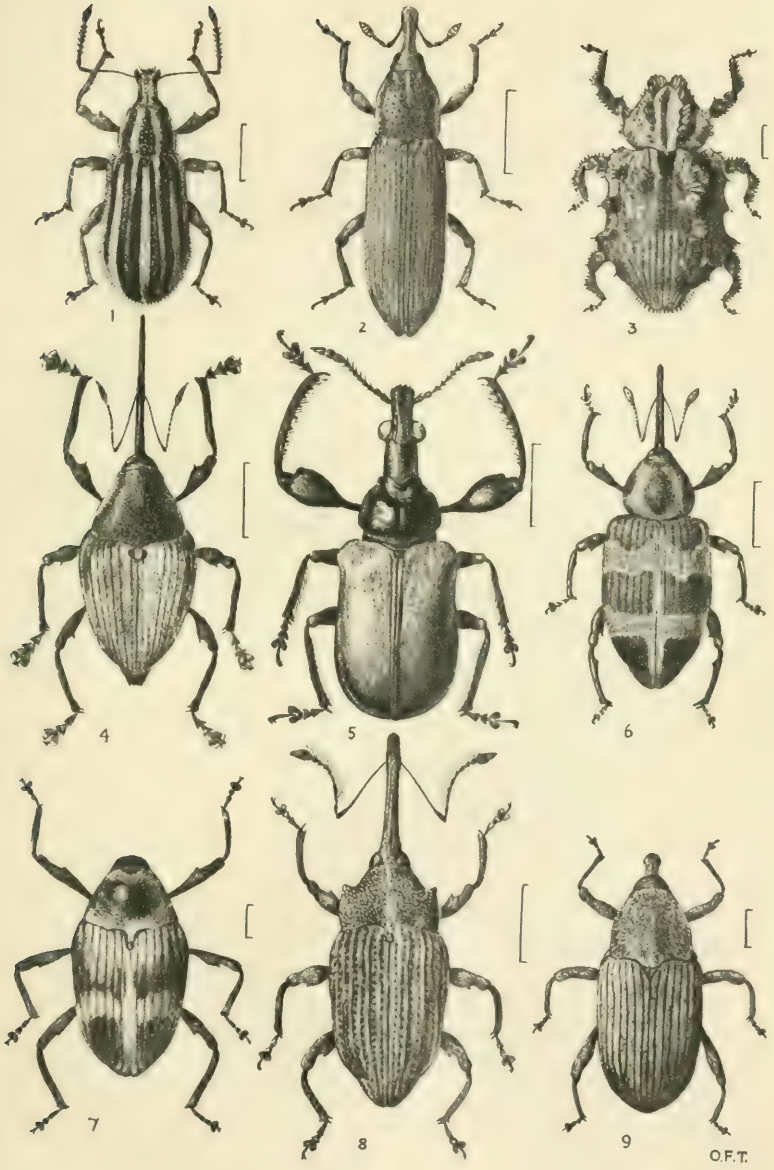
Fig. 1. *Phytoscaphus fractivirgatus*, sp. n., ♀.
Fig. 2. *Lixocleonus incanus*, sp. n., ♀.
Fig. 3. *Cyphomydica quadrifloccosa*, sp. n., ♂.
Fig. 4. *Balaninus nigricollis*, sp. n., ♂.
Fig. 5. *Attelabus lacertosus*, sp. n., ♂.
Fig. 6. *Hedychrous rufofasciatus*, sp. n., ♀.
Fig. 7. *Lobotrachelus postoculatus*, sp. n., ♂.
Fig. 8. *Plococerus denticollis*, sp. n., ♂.
Fig. 9. *Baris cordiæ*, sp. n., ♀.

XXXIII.—*On Marine Triassic Shells from Singapore.* By R. Bullen Newton, I.S.O., F.G.S., Geological Department, British Museum (retired).

[Plate IX.]

Introduction.

As a further contribution to the geology of the Federated Malay States, we are again indebted to Mr. John B. Scrivenor, M.A., F.G.S., the Government Geologist of that region, for some new fossiliferous material obtained from the island of Singapore. The specimens in question, which are entirely of marine origin, were found in a soft, pinkish, fine-grained, argillaceous sandstone, forming a cutting on Morse Road, Mount Faber, at about 100 yards from the highest point of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the road. According to Mr. Scrivenor, "the general dip of the beds in this area is south-west, but there are local variations in direction, while the amount of dip varies considerably, some beds being vertical."

Unfortunately the fossils are badly preserved and often fragmentary, consisting chiefly of Pelecypod Mollusca, a few other groups being sparsely represented, such as the Gastropoda, Brachiopoda, and small indeterminable corals, as well as the merest fragment of an ammonite. Having to rely entirely on material which is composed of casts and impressions without a vestige of calcareous structure, it has proved a somewhat difficult task to prepare the present report and to offer satisfactory results on their study and examination. Many of the sandstone impressions, however, exhibit certain sculpture details which have been capable of reproduction by the aid of plasticine squeezes, and these, especially in connection with the Pelecypod valves, have yielded valuable evidence relating to external features, and thus making it possible to propose some interesting determinations which it is hoped will add to our scanty knowledge of the palæontology of the Malayan area.

This is the second occasion that Mr. Scrivenor has obtained fossils from Singapore, his first collection having come from the Mount Guthrie (now demolished) clay-beds, which, according to my report at that time (Geol. Mag. 1906, pp. 487–496, pl. xxv.), contained marine molluscan shells, although their association with terrestrial plant-remains favoured an estuarine origin for the deposits. Among those plants I determined the presence of *Podozamites*, a fact which offered the suggestion that the Mount Guthrie beds might prove to be an extension of the Upper Gondwana deposits of India, and therefore probably of Inferior Oolite or Bajocian age.

According to Mr. Scrivenor, the present Mount Faber fossils are of higher horizon than those from Mount Guthrie, although he inclines to the view that they may form part of the same series of deposits.

One of the more important Pelecypods from Mount Faber is that belonging to the genus *Myophoria*, so characteristic of Triassic times, and which has been previously recorded by me from the Pahang sandstones at Kuala Lipis and assigned to an Upper Triassic age (Proc. Mal. Soc. London, 1900, vol. iv. p. 134, pl. xii.). Those sandstones singularly resemble lithologically the rock from Mount Faber—a fact rendering it possible that both deposits are of similar geological horizon, and may therefore extend from Pahang as a

continuous series to Singapore, a distance of roughly some 200 miles.

In concluding this preliminary statement, I wish to thank Messrs. C. D. Sherborn, F.Z.S., W. H. Broadbent, and H. B. Rowbotham for bibliographical and other assistance connected with the preparation of my report. Further, it should be mentioned that the Singapore fossils here described have been presented by Mr. Scrivenor to the Geological Department of the British Museum.

Descriptions.

Mollusca—Cephalopoda.

(An Ammonoid shell.) (Pl. IX. fig. 29.)

Remarks.—In this collection there is one little fragment of an Ammonoid fossil which is interesting to record as proving the presence of Cephalopodous Mollusca in the Singapore beds. It represents a portion of a depressed whorl with indications of straight ribs and furrows connecting with some well-separated knob-like tubercles situated within a short distance of the inner margin. The fragment is not, of course, determinable, but there is just a resemblance to the genus *Balatonites* of Mojsisovics from the Muschelkalk division of the Trias of Europe and other countries.

Gastropoda.

Family **Mathildiidæ.**

Genus Promathildia, Andreæ.

Promathildia colon, Wissmann. (Pl. IX. fig. 28.)

Turritella colon, Wissmann, Münster's Beitr. Petref.-Kunde, 1841, part 4, p. 119, pl. xiii. fig. 20.

Promathildia colon, E. Kittl, Annal. Nat. Hofmus. (Wien), 1894, vol. ix. no. 2, pp. 229, 230, pl. x. figs. 4–6.

Remarks.—The specimen agrees with the figure and description of this species as originally published, as well as with those issued by Dr. Kittl, its axis being composed of a conically formed spire with flattened sides to the deeply sutured whorls, the upper and lower margins of which are tubercled, while the spaces between are occupied by nearly vertical ribs crossed by very fine spiral striations. These spiral striations are, however, much too delicate to have been preserved on the Singapore impression, although the marginal

tubercles and subvertical costæ can be clearly seen. The fossil is represented by a sandstone cavity, the characters of which have been quite well reproduced in a plasticine squeeze. It measures 9 mm. in length and 6 mm. in basal diameter.

Distribution.—The species belongs to the St. Cassian Beds, whilst the genus is recorded from Indo-China by Mansuy.

Pelecypoda.

Family Ostreidæ.

Genus Lopha, Bolten. [Syn. *Alectryonia*, Fischer.]

Lopha cf. *montis-caprilis* (Klipstein).
(Pl. IX. figs. 1, 2.)

Ostrea montis-caprilis, Klipstein, Beitr. Geol. Östlichen Alpen, 1845, p. 247, pl. xvi. fig. 5; Alberti, Ueberblick Trias Alpen, 1864, p. 64; Arthaber, in Frech's Lethæa Geognostica, Trias, 1905, vol. i. part 2, pl. xlii. fig. 8.

Alectryonia montis-caprilis, Arthaber, Frech's Lethæa Geognostica, Trias, 1905, vol. i. part 2, p. 241.

Remarks.—This oyster is represented by two specimens. The form indicated by Pl. IX. fig. 1 is a natural sandstone cast of a valve showing internal features. It is of narrow elongate contour and more or less oval; the margins are furnished with stout radial and sometimes bifurcating costæ, whilst the smooth floor of the valve bears a semicircular laterally situated adductor scar impression which is nearer the summit region than the ventral margin. This specimen shows a distinct resemblance to Miss Healey's *Alectryonia* cf. *haidingeriana*, Emmrich, from the Uppermost Trias (Rhætic) of Napeng, Burma ('Palæontologia Indica,' 1908, new series, vol. ii. Mem. 4, p. 37, pl. v. figs. 17–19), but in the absence of figures of Emmrich's type from the Alpine Trias its identification in rocks from far-removed localities must always remain uncertain. In the present case the Singapore valve is very likely to be the form described by Miss Healey, and, moreover, Klipstein's *Ostrea montis-caprilis* may really embrace the shell described by Emmrich at a later date (Jahrb. Geol. Reichs. Wien, 1853, vol. iv. p. 377).

This specimen exhibits a length of 16 mm. and a height of 30 mm.

The second example is better preserved, although of smaller size. It possesses a more or less regular costal system, proceeding from a central ridge-like elevation, the

costæ being equal, distant, radiating, sometimes dichotomizing, and separated by deep furrows, the walls of which are transversely and minutely striated, such as is represented on figure 19 of Miss Healey's memoir. The dimensions of this shell show a length of 12 mm. and a height of 20 mm.

A fairly close relationship may also be traced in the Singapore fossils to *O. marcignyana* of Jules Martin from the *Avicula contorta* zone of France (Mém. Soc. Géol. France, 1863, ser. 2, vol. vii. p. 90, pl. vi. fig. 24).

Distribution.—St. Cassian, Raibler and Rhætic Beds of European Alpine regions, &c.

Family Pectinidæ.

Genus Chlamys, Bolten.

Chlamys valoniensis? (Defrance), Leymerie.
(Pl. IX. figs. 3–5.)

Pecten valoniensis (Defrance), De Caumont's "Sur quelques terrains Normandie Occidentale," Mém. Soc. Linn. Calvados, 1825, vol. ii. p. 507, pl. xxii. fig. 6 (imperfectly figured and not described); Leymerie, Mém. Soc. Géol. France, 1838, vol. iii. pt. 1, pp. 346, 347, pl. xxiv. fig. 6.

Chlamys valoniensis, R. B. Newton, Proc. Mal. Soc. London, 1900, vol. iv. pl. xii. fig. 1, p. 131.

Remarks.—It is almost impossible to determine the natural sandstone casts here figured, on account of their imperfect preservation. With regard, however, to those represented by figures 3 and 4 (Pl. IX.) there is an appearance of sculpture characters recalling what I have already figured from the Myophorian Sandstone of the Malay Peninsula (Proc. Mal. Soc. London, 1900, vol. iv. pl. xii. fig. 1, p. 131) as *Chlamys valoniensis* (Defrance) of Leymerie. They exhibit similar fine intermediate ribs between the more prominent costæ, and are, moreover, of fan-shaped contour. The specimen depicted by figure 5 (Pl. IX.) is of rather similar structure, and scarcely to be separated from the others. All three examples are without the cardinal expansions, showing how desirable it is for the acquisition of better material, so that a more accurate determination could be made.

Distribution.—Characteristic of the later Trias (Rhætic) epoch, having been recorded from England (*C. Moore*), Ireland (*Portlock*), Europe (*Leymerie &c.*), India (*Stoliczka &c.*), and the Malay States (Pahang).

Genus Syncyclonema, Meek.

Syncyclonema sp. (Pl. IX. fig. 6.)

Remarks.—There are three or four fragments of a smooth *Pecten*-like shell undoubtedly belonging to this genus, which, according to Miss Healey's monograph (Pal. Indica, 1908, new ser. vol. ii. Mem. 4, pl. vii. figs. 4–11, pp. 45–48), is numerously represented in the Burmese deposits at Nepang. The present specimens are quite small, the largest having a length of about 8 mm. and a height of about 11 mm. They seem to belong to one species, although differing from the Burmese *S. quotidianus* of Miss Healey in its smaller size and more elongate form, yet agreeing in the possession of closely set, microscopical, concentric lines crossed by nearly obsolete radial striations. The lateral margins diverge with steep inclinations from an acute umbonal region, besides bearing evidence of rather elongate expansions. The specimen figured is a natural cast in the matrix of slight convexity, but the valve showing the concentric sculpture is a sandstone impression forming a narrow and shallow concavity.

It is interesting to mention that *S. quotidianus* of Healey has been recorded from the Rhætic of Indo-China by Dr. Mansuy (Mém. Serv. Géol. Indochine, 1912, vol. i. fasc. 4, p. 50).

Family Spondylidæ.

Genus Spondylus, Linnæus.

Spondylus dubiosus (Bittner). (Pl. IX. fig. 15.)

Spondylus granulosus, Klipstein, Beitr. geol. Östlichen Alpen, 1845, p. 245, pl. xv. figs. 27 (non Deshayes, 1830).
Spondylus acute-costatus, Klipstein, ibid. p. 245, pl. xv. fig. 28.
Pecten subgranulosus, Orbigny, Prodrome Paléontologie, 1850, vol. i. p. 202.
Hinnites granulosus, Laube, Fauna Schichten von St. Cassian, 1865, part 2, p. 74.
Mysidioptera (?) *dubiosa*, Bittner, Abhandl. Geol. Reichs. 1895, vol. xviii. pp. 199, 200, pl. xxii. figs. 19, 20.

Remarks.—The collection contains two small pectiniform shells preserved as a cast and a cavity impression in the matrix, plasticine reproductions of which display the chief characters of this species. It exhibits a subelongate outline, besides being furnished with subrounded, equidistant, radial costæ while the sculpture consists of very close, micro-

scopically fine, concentric striations covering both the summits of the costæ and the intermediate furrows. The horizontal hinge-line and small lateral expansions are only very obscurely preserved, and in addition it may be stated that occasional evidence exists suggesting the presence of granulations on the costal summits, as in the type—this remark having reference to some minute perforations observed on the costæ. It is interesting to note that Laube's figure gives an excellent idea of the Singapore specimens.

The dimensions of the present examples are about 10 mm. for both length and height.

I have retained the generic name of *Spondylus* for this species as initiated by Klipstein, its characters widely separating it from either *Hinnites* or *Mysidioptera* as suggested by Laube and Bittner.

It is, however, only right to retain Bittner's species *dubiosa*, as Klipstein's name had been earlier associated by Deshayes with another shell.

Distribution.—St. Cassian Beds.

Genus Prospondylus, Zimmermann.

Prospondylus comtus (Goldfuss). (Pl. IX. figs. 18, 19.)

Ostracites spondyloides, Schlotheim, Versteinerungen aus V. Schlotheim's Sammlung (Nacht. Petrefk.), 1823, pl. xxxvi. fig. 1 *a* (non Gmelin).

Ostrea comta and *Spondylus comtus*, Goldfuss, Petref. Germaniæ, 1833 and 1836, vol. ii. p. 4, pl. lxxii. fig. 6, and p. 93, pl. cv. figs. 1.

Hinnites comtus, Giebel, Abhandl. Nat. Ver. Sachsen Thüringen, 1856, vol. i. p. 77, pl. vi. fig. 4.

Prospondylus comtus, Wysogorski, Frech's Lethæa Geognostica, Trias, 1903, vol. i. pl. iv. fig. 3, pp. 59 & 258.

Remarks.—The shell here referred to consists of a shallow iron-stained impression, a plasticine squeeze yielding a good representation of the external features of a left valve possessing a somewhat quadrate contour. The apical region appears to be central and the hinge-line horizontal, while a byssal area is probably traceable on the right corner of the fossil. The surface is covered with numerous and radially arranged costæ of rather irregular descent, both primaries and secondaries, the former being elevated and equidistant, besides enclosing three or four finer and more delicate ribs or riblets. The costæ have distant spinous summits, whereas the riblets are most minutely granulated and their extremely small furrows are crossed by numerous and microscopically minute striations. The specimen shows imperfect margins, especially at

the sides and ventrally, while its dimensions give a length of 27 mm. and a height of 25 mm.

The sculpture is very similar to that seen in the Goldfuss figures of *Spondylus velatus* from the Lower Oolite rocks of Germany; there is also a probably closer resemblance to Giebel's interpretation of *Spondylus comtus* described and figured by Goldfuss (Petref. Germaniæ, 1836, vol. ii. p. 93, pl. cv. figs. 1), which was regarded under *Hinnites*, from the Muschelkalk of Lieskau, Germany (Abhandl. Nat. Ver. Sachsen Thüringen, 1856, vol. i. p. 25, pl. vi. fig. 4), and to which the present fossil is here referred. Such forms of Spondyloid shells are now recognized under Zimmermann's genus *Prospondylus* (Jahrb. Konigl. Preuss. Geol. Landes. Berlin, (1885) 1886, pp. 105–119, pl. ii.), of which the type is *P. liebeanus*, Zimm., from the Thuringian Zechstein rocks. Following, therefore, both Wysogorski and Arthaber in Frech's 'Lethæa Geognostica,' 1903, p. 59, and 1905, p. 258, the Singapore fossil is here recognized under that genus. This type of shell was formerly regarded as Defrance's *Hinnites*, a generic name now restricted to species belonging entirely to Tertiary and later seas. The genera *Eopecten*, Douvillé (Bull. Soc. Géol. France, 1897, ser. 3, vol. xxv. p. 203), and Philippi's *Velopecten* (Zeitsch. Deutsch. Geol. Ges. 1898, vol. l. pp. 597–622, pl. xix.), both founded on the same type, viz., *Spondylus tuberculosus* of Goldfuss, appear to be synonyms of *Prospondylus*.

Distribution.—The Muschelkalk of Europe.

Family Aviculidæ.

Genus Gervillia, Defrance.

Gervillia scrivenori, sp. n. (Pl. IX. fig. 20.)

Description.—Shell (a left valve) small, oblique, more or less oblong, with a very anterior umbone and a horizontal cardinal line; posterior wing extensive, excavated, and marginally sinuated; the anterior and posterior areas are divided by a long, sloping, umbonal ridge, the anterior end being rounded, while the ventral margin is horizontal and nearly parallel with the hinge-line; sculpture consists of closely arranged horizontal and concentric ridges, bearing numerous minute granulations, which extend over the umbonal ridge and the posterior expansion.

Dimensions.—Length 13 mm., height 6 mm.

Remarks.—This small fossil occurs in the matrix as an iron-stained impression, although its true characters are

better seen in the plasticine model. It probably approaches nearest in shape to Pichler's *Avicula aspera* (Neues Jahrb. 1857, p. 694, text-figure) from the European Raibler-Schichten (see Arthaber, in Frech, 'Lethæa Geognostica,' Trias, 1905, vol. i. pp. 300, 315, 428), which is Upper Trias, although that species differs in ornamentation by consisting of strongly serrated concentric ribbing with no evidence of granulations.

The granulated character of the Singapore shell, giving somewhat the appearance of a minutely decussated structure, appears to separate it from other forms of this genus known in Triassic seas.

The specific name is in honour of Mr. John Brooke Scrivenor, M.A., F.G.S., the Geologist of the Federated Malay States.

Genus Cassianella, Beyrich.

Cassianella cf. *tenuistria* (Münster).
(Pl. IX. figs. 23, 23 *a*, & 23 *b*.)

Avicula tenuistria, Münster, in Goldfuss, Petrefacta Germaniæ, 1836, vol. ii. p. 127, pl. cxvi. figs. 11; Wissmann, in Münster's Beitr. Geogn. Petref. Tirol, 1841, part 4, p. 76, pl. vii. fig. 8.

Cassianella tenuistria, Beyrich, Zeitsch. Deutsch. geol. Ges. 1862, vol. xiv. p. 9; Laube, Denksch. Akad. Wiss. 1865, pp. 48, 49, pl. xvii. figs. 3; Bittner, Abhandl. Geol. Reichs. 1895, vol. xviii. p. 58, pl. vi. fig. 9.

Remarks.—The occurrence of Beyrich's genus *Cassianella* among these fossils is of considerable interest from the geological point of view, as it is very characteristic of the Trias formation, being particularly abundant in the St. Cassian and Muschelkalk Beds of Europe.

The specimen from Singapore represents a left valve standing well out of a small sandstone block. Its measurements show a length of 11 mm., a height of 18 mm., and a depth of 10 mm., these being in excess of typical forms of this species from Europe, which rarely have a greater height than 10 mm. The valve is well arched, elongately subtriangulate, and provided with an incurved umbo, while the umbono-lateral regions possess modified auricular expansions extending from a short horizontal hinge-line. A wide and an obliquely depressed area forms the posterior side, which is circumscribed by an obtuse umbonal ridge reaching to the ventral angle.

The ornamentation consists of well-expressed and more or less equidistant concentric ridges, which are crossed by

numerous microscopically fine striations. From contour and sculpture characters, therefore, it is considered that this fossil is closely related to the German species.

Dr. Mansuy refers to a related form occurring in the Tonkin Trias (Mém. Serv. Géol. Indochine, 1919, vol. vi. fasc. 1).

Distribution.—European: St. Cassian Beds and Indo-China.

Family Arcidæ.

Genus Cucullæa, Lamarck.

Cucullæa (?). (Pl. IX. fig. 17.)

Very little definite information can be given of the imperfect natural cast of a probable left valve represented by fig. 17 (Pl. IX.). In contour it is seen to be more or less quadrate, slightly elevated above, obtusely and umbonally angulate, forming flattened sides, while the sculpture presents a series of equidistant concentric ridges crossed by obscure radial striæ. The hinge-line is horizontal and parallel with the ventral margin, but the umbonal region has been unfortunately fractured. I am inclined to regard this specimen as belonging to the Arciform shells, its probable position being in the neighbourhood of *Cucullæa* on account of its quadrate shape and character of ornamentation. The dimensions of the valve exhibit a length of 18 mm. and a height of 15 mm.

Family Carditidæ.

Genus Palæocardita, Conrad.

Palæocardita cf. *crenata* (Goldfuss).
(Pl. IX. fig. 16.)

Cardita crenata, Goldfuss, Petrefact. Germaniæ, 1837, vol. ii. pp. 185, 186, pl. cxxxiii. figs. 6; Laube, Fauna Schichten von St. Cassian, 1865, part 2, p. 42, pl. xv. fig. 11; Bittner, Lamellibranchiaten der Alpinen Trias, Abhandl. Geol. Reichs. 1895, vol. xviii. pp. 34–37, pl. iv. figs. 5–13; Arthaber, in Frech's Lethæa Geognostica, Trias, 1905, vol. i. part 2, pl. xxxix. fig. 8.

Palæocardita crenata, Zittel, Handb. Palæontologie, 1881, vol. ii. p. 65, text-fig. 92; Mansuy, Bull. Serv. Géol. Indochine, 1920, vol. vii. fasc. 3, p. 31.

Remarks.—The specimen herewith referred to as above consists of an iron-stained impression of a right valve of which the posterior region is not preserved. A plasticine squeeze from the cavity exhibits a numerously costated

external surface, the costæ possessing more or less acutely-shaped and crenated summits, whereas the intermediate furrows are furnished with fine and closely set concentric striations. Such characters are well expressed in undoubted forms of this species, but the absence of the posterior half of the Singapore specimen makes its determination a little doubtful, although it may be accurately referred to as a very closely allied form. The original length of the valve probably measured more than 25 mm., while the height gives 17 mm.

The genus *Palæocardita* of Conrad (American Journ. Conch. 1867, vol. iii. p. 11) was founded on *Cardium austriacum* of Hauer from the Kossen Beds (=Rhætic) of Austria (Jahrb. Geol. Reichs. 1853, vol. iv. p. 736), a species closely related to *Cardita crenata* of Goldfuss.

Distribution.—St. Cassian Beds of Europe and Indo-China.

Family Trigoniidæ.

Genus Myophoria, Bronn.

Myophoria ornata, H. L. Wissmann. (Pl. IX. fig. 14.)

Myophoria ornata, H. L. Wissmann, Münster's Beitr. Geogn. Petrefactenk. Tirol, 1841, part 4, pp. 88, 89, pl. viii. figs. 21.

Cardita elegans, Klipstein, Beitr. geol. Östlichen Alpen, 1843, p. 255, pl. xvi. fig. 21.

Myophoria ornata, Laube, Fauna Schichten von St. Cassian, 1865, part 2, p. 56, pl. xviii. fig. 2; R. B. Newton, Proc. Mal. Soc. London, 1900, vol. iv. p. 134, pl. xii. figs. 12–14; L. Waagen, Abhandl. Geol. Reichs. 1907, vol. xviii. part 2, pp. 75, 76, pl. xxxiii. figs. 17.

Remarks.—It is interesting to find a species among these fossils already determined from the Myophorian sandstone of the Malay Peninsula. The present specimen forms an excellent matrix-cavity, presenting external features of a left valve, a plasticine cast of which demonstrates that it was of considerable convexity and possessed a horizontal hinge-margin. The costal characters are well exposed, whilst the intermediate furrows are furnished with a series of fine horizontally concentric striations, the summits of the costæ being obscurely and minutely tubercled. This valve is the only specimen in the collection, its dimensions showing a length of 10 mm. and a height of 9 mm.

Distribution.—Europe, St. Cassian Beds and *Pachycardia* Beds; Malay States (Pahang).

Myophoria cf. *goldfussi*, Alberti.
(Pl. IX. fig. 13.)

Myophoria goldfussi, Alberti, Beitr. Bunten Sandsteines, &c., 1834, p. 93.
Lyrodon goldfussi, Goldfuss, Petrefacta Germaniæ, 1837, vol. ii. p. 199, pl. cxxxvi. fig. 3.
Myophoria goldfussi, Alberti, Ueberblick über die Trias-Alpen, 1864, p. 112, pl. ii. fig. 4; Giraud, Bull. Serv. Géol. Indochine, 1918, vol. v. fasc. 1, pp. 40, 41.

Remarks.—This determination refers to a small left valve (length 8, height 9 mm.) represented as an iron-stained matrix impression, a squeeze of which in plasticine gives an external view of a shell probably related to Alberti's *M. goldfussi*. The margins are of rather similar contour, but the costæ are fewer, being about seven instead of about twelve as in the European form. The costæ, however, are of the same thin, radial, and curved type, and separated by similar wide furrows, these latter being furnished with extremely fine and close concentric striations so characteristic of the German form. The sculpture also bears a resemblance to Miss Healey's *M. napengensis* from Burma (Pal. Indica, 1908, new ser. vol. ii. Mem. 4, pp. 37–42, pl. vi. figs. 1–29), although that is a larger and much more convex species. From the small number of costæ and their distant separation, the Singapore valve shows a further resemblance to *Myophoria* (*Cardium*) *harpa* of Münster (Goldfuss, Petrefacta Germaniæ, 1837, vol. ii. p. 219, pl. cxliii. figs. 13) from the St. Cassian Beds.

Distribution.—The Muschelkalk and Keuper Beds of Europe and Indo-China.

Myophoria bittneri, sp. mut.
(Pl. IX. figs. 10–12.)

Lyrodon goldfussi, Eichwald, Geogn. Ausflugnach Tyrol, Nouv. Mém. Soc. Imp. Nat. Moscou, 1851, vol. ix. pp. 127, 128, pl. i. figs. 7 (non Goldfuss, 1837).
Myophoria cf. *vestita*, Bittner, Lamellibranchiaten der Alpinen Trias, Abhandl. Geol. Reichs. 1895, vol. xviii. pp. 103, 104, pl. xii. fig. 14.

Remarks.—The specimens referred to this species consist of cavity impressions representing a right and two left valves. They are distinguished from most forms of *Myophoria* by the presence of a series of short, equally distant, and nearly horizontal ribs on the posterior area, while the longitudinal costæ are nodulated. The valve-measurements vary from

between 10 and 12 mm. for both the length and height, which are rather in excess of those described by Eichwald and Bittner. It is quite easily seen that this species is related to *M. vestita* of Alberti from the St. Cassian Beds, as pointed out by Bittner, on account of the horizontally ribbed posterior area, although the absence of costal nodulations on the true *M. vestita* is sufficient evidence for separating the two forms.

In accordance with this view, therefore, it is suggested that the new name of *M. bittneri* should be introduced for this shell, in recognition of the late Dr. Alexander Bittner, well known as a writer on Triassic Pelecypoda &c. from Europe and India.

A somewhat similar tubercled ornamentation may be observed on Trechmann's *Myophoria otamitensis* from the Upper Trias (Carnian) of New Zealand, although that form is without the horizontal ribs (Quart. Journ. Geol. Soc. 1918, vol. lxxiii. pl. xxii. fig. 8, p. 211).

In ordinary circumstances Eichwald's specific name *goldfussi* (*Lyrodon*) might have been employed for the species in question, had not the same been used previously for another form of the genus by Goldfuss himself.

Distribution.—Europe (Alps), St. Cassian Beds.

Myophoria sp. indet. (A). (Pl. IX. fig. 7.)

Remarks.—This figure represents a matrix cast of a fragmentary right valve of *Myophoria*, showing the typical and distant radial costæ of the anterior region of some forms of this genus. Being merely a cast, and consequently without sculpture-characters, it is not possible to even suggest its specific determination. The fossil shows a height of 12 mm.

Myophoria sp. indet. (B). (Pl. IX. figs. 8, 9.)

Remarks.—Two further casts of this genus are here figured, although of smaller size than that represented by fig. 7. They possess more or less rounded posterior contours, while the anterior regions exhibit the characteristic divergent costations. Both specimens are left valves and evidently one species, but without sculpture it is useless to attempt an identification of the species to which they may formerly have belonged. Their measurements are about 10 or 11 mm. in both directions.

Family **Lucinidæ**.

Genus Schafhautlia, Cossmann.

Schafhautlia astartiformis (Wissmann).
(Pl. IX. figs. 21, 22.)

Isocardia astartiformis, Wissmann, Münster's Beitr. Geogn. Petrefactenk. Tirol, 1841, p. 87, pl. viii. fig. 24.
Corbis astartiformis, Laube, Fauna Schichten von St. Cassian, 1865, part 2, pp. 37, 38, pl. xv. figs. 5.
Gonodon astartiformis, Bittner, Abhandl. Geol. Reichs. 1895, vol. xviii. part 1, p. 12, pl. iii. figs. 1–4.

Remarks.—An excellent representation of this species is given in a plasticine squeeze from a matrix cavity which exhibits a left valve having a length-measurement of 13 mm. and a height of 11 mm. The specimen shows it to be a globose form furnished with a horizontal hinge-line, while the surface is covered with numerous regular concentric ridges. It agrees in every way with figures of this species as demonstrated in the above literature, being besides more or less characteristic of the St. Cassian Beds. This fossil also bears a strong resemblance to Miss Healey's *Dentilucina mona* from the Burmese Rhætic beds ('Palæontologia Indica,' 1908, new ser. vol. ii. Mem. 4, p. 70, pl. ix. figs. 21).

The generic name *Schafhautlia* was established by M. Cossmann in 1897 to replace *Gonodon* of Schafhäutl, 1863, which was found to be preoccupied ('Revue Critique Paleozoologie,' 1897, vol. i. p. 51). *Schafhautlia* belongs to the *Corbis* group of the Lucinidæ, and has been adopted by L. Waagen (Abhandl. Geol. Reichs. 1907, vol. xviii. part 2, pp. 84, 85) in his "Lamellibranchiaten der Pachycardientuffe."

Distribution.—European : St. Cassian and Raibler Beds.

Family **Astartidæ**.

Genus Opis, Defrance.

Opis cf. *hoeninghausi* (Klipstein).
(Pl. IX. fig. 24.)

Cardita höninghausii, Klipstein, Beitr. Geol. Östlichen Alpen, 1843, p. 254, pl. xvi. figs. 20.
Opis heninghausii, Orbigny, Prod. Paléont. 1850, vol. i. p. 198.
Opis höninghausii, Laube, Denksch. Akad. Wiss. (1865) 1866, vol. xxv. part 2, p. 41, pl. xvi. figs. 1.
Opis (*Cælopis*) *hoeninghausii*, Bittner, Abhandl. Geol. Reichs. 1895, vol. xviii. pp. 30, 31, pl. iii. figs. 20, 21.

Remarks.—Although only very fragmentary and consisting

of a sandstone cavity indicating the external features of a right valve, the specimen here figured represents most probably Klipstein's *Cardita hoeninghausii* from the St. Cassian Beds of the Tyrol. Its dimensions show a length of 10 mm., while in height it is of similar measurement. In contour the valve is more or less trapezoidal, with a well curved and elevated central region sloping anteriorly, while the posterior side is widely furrowed from the incurved umbonal region to the antero-ventral margin, and outwardly margined by a carina more or less parallel with the central convex part of the shell. The surface is ornamented with prominent, regular, concentric ridges and furrows, the latter having perfectly smooth floors, and therefore without evidence of transverse striations. The true form of this species has a well-excavated lunule, which is one of the chief characters of *Cœlopis*, founded by Munier-Chalmas in 1887; hence Bittner has included it in that genus. As the present specimen shows no lunulate characters, being besides marginally imperfect, it will be more satisfactory to assign it to the genus *Opis*—at any rate, until the time arrives when better material may help us to a more accurate determination.

Distribution.—St. Cassian Beds.

Family **Modiolopsidæ**.

Genus Modiolopsis, Hall.

Modiolopsis gonoides, Healey. (Pl. IX. fig. 25.)

Pleurophorus elongatus?, R. B. Newton, Proc. Mal. Soc. London, 1900, vol. iv. p. 133, pl. xii. fig. 8 (non Moore).
Modiolopsis gonoides, Healey, Pal. Indica, 1908, new ser. vol. ii. Mem. 4, pp. 51–53, pl. vii. figs. 13–17.

Remarks.—This specimen is represented by a single natural sandstone cast of a left valve showing internal characters. It is of small size, measuring 13 mm. in length, and so far as can be seen its height is 5 mm., although that might be increased upon if it were not that the pallial surface is not wholly exposed. Sufficient is observed, however, to determine the cast as possessing more or less dorsal and ventral parallel margins, while a characteristic, obtuse and oblique, umbonal, ridge-like elevation stretches posteriorly towards the ventral angle. Beneath the umbo, which is very anterior, is a rounded knob-like body, furnishing evidence of the former existence of a deeply impressed adductor scar in the valve

itself. This specimen and those from Pahang show undoubted affinities to Alberti's interpretation of Dunker's *Modiola gastrochæna* from the European Trias ('Ueberblick Trias Alpen,' 1864, p. 130, pl. iii. figs. 3).

Sandstone casts of similar valves to the present shell were described by me in 1900 as occurring in the Upper Triassic beds of the Malay Peninsula, under the doubtful determination of Moore's *Pleurophorus elongatus* from British Rhætic deposits. Since then Miss Healey has identified the same shell from better-preserved specimens in the Burmese Rhætic, recognizing it under the new specific name of *gonoides* to replace my *elongatus*?, which she considered as different from the type. This writer has also given reasons for regarding the species as belonging to James Hall's genus *Modiolopsis*, founded on *Cypricardites modiolaris* of Conrad from the Silurian of New York State, thus separating it from *Pleurophorus* on account of an edentulous hinge and some differences in sculpture. The Singapore valve, notwithstanding its incompleteness, seems to have close affinities with both the Pahang and the Burmese examples, and is therefore of interest to record in the history of this fauna, whilst its present determination is in accordance with Miss Healey's published views on this species.

A closely related form has been described and figured by Mansuy as *Pleurophorus* (*Modiolopsis*) cf. *gonoides*, Healey, from Indo-China (Mém. Serv. Géol. Indochine, 1912, vol. i. fasc. 4, p. 30, pl. vii. fig. 5).

Distribution. Upper Trias of Pahang, Burma, and Indo-China (a related form).

Brachiopoda.

Family **Terebratulidæ**.

[A Terebratuloid shell.] (Pl. IX. fig. 26.)

Remarks.—The specimen here referred to consists of the upper portion of a small iron-stained natural sandstone cast of a probable Terebratuloid shell, showing internal features, but possessing imperfect marginal limitations, although parts of both valves are observed to be closed and in their proper relative positions. The dorsal or smaller valve exhibits a narrow central groove answering to a septum, on each side of which is a narrowly elongate muscular scar-marking. The larger or ventral valve is furnished with a prominently

arched and perforated beak, while its outer surface has a fairly wide depression situated between two divergent obtuse carinations descending from the summit to the basal region. The dimensions of this specimen give a height of 12 mm. and a width of 8 mm. across the ventral valve, whilst the greatest diameter through both valves is 11 mm. It is difficult to determine such a fossil even generically, and it must therefore be left until more suitable material is obtained.

Family Spiriferidæ.

Genus Spiriferina, Orbigny.

Spiriferina cf. *fragilis* (Schlotheim).
(Pl. IX. fig. 27.)

Terebratulites fragilis, Schlotheim, Taschenbuch (Leonhard), 1813, vol. vii. p. 104, pl. ii. fig. 5.
Spiriferina fragilis, Alberti, Ueberblick Trias Alpen, 1864, p. 157; Frech, Lethæa Geognostica, 1905, Trias, vol. i. p. 60, pl. xxxv. fig. 9.

Remarks.—This little shell, having the following dimensions—length 7 mm., width 5 mm., depth 4 mm.,—is represented by a sandstone cavity from which a plasticine reproduction has been made, thus displaying a ventral or larger valve of a *Spiriferina* closely allied to *S. fragilis* from the German Trias. It possesses a deeply cut and radially ribbed sculpturing, whilst the wide median furrow is occupied by a feeble central rib, this latter feature not apparently being present in the true *S. fragilis*, so far as can be ascertained. Affinities with this species are doubtless to be found in Palæozoic rocks among such forms as *S. cristata* of Schlotheim from the Permian and *S. octoplicata* of J. de C. Sowerby from Carboniferous horizons.

Distribution.—The species was originally described from the European Muschelkalk or middle part of the Triassic system, while it has since been recognized by Piroutet in New Caledonia (Bull. Soc. Géol. France, 1908, ser. 4, vol. viii. p. 325), and by Dr. Trechmann in New Zealand (Quart. Journ. Geol. Soc. 1908, vol. lxxiii. pp. 219, 220, pl. xxiv. figs. 10–12), whilst a related form—*S. lilangensis*, Stoliczka, —has been recognized by Bittner in the Muschelkalk of the Himalayas (Pal. Indica, 1899, ser. 15, vol. iii. part 2).

Conclusions.

From a study of this small fauna discovered in the Singapore Sandstones it is possible to trace specific connections with that characterizing certain Trias deposits of Europe.

Similar resemblances have been recorded by Dr. Mansuy in his palæontological researches on the Triassic rocks of Indo-China. In those deposits that author was able to trace faunistic affinities with European types occurring in the German Muschelkalk, as well as in the Alpine and Mediterranean Trias. Relationships were also observed among the same horizoned faunas of the Himalayas, where the Ladinian, Carnian, and Norian stages of the Trias formation have been recognized, whilst Dr. Trechmann has alluded to similar affinities in connection with fossils from the New Zealand Trias. It is difficult, however, to attempt a close correlation of the Singapore deposits with the Eastern developments of the Triassic system, on account of the paucity of fossils, although the tabulation of the fauna as inserted on pp. 318 and 319, exhibiting more or less the distribution of the species that have been recognized, may be of service in this direction. The facies of the fauna is distinctly that belonging to the St. Cassian Beds of the Austrian Tyrol; on the other hand, two or three forms suggest an origin among the older deposits of the Muschelkalk, whereas others exhibit a later or Rhætic character. Lithologically the same throughout, it is certain that the Singapore deposits must be of one geological horizon, and forming, as it seems possible, a continuation of the Myophorian Sandstone of Pahang developed some 200 miles north of Singapore, which has been regarded as of Rhætic age, although, like the Singapore material, containing both St. Cassian and Muschelkalk species.

This Rhætic age of the Pahang fauna was determined by myself in 1900. A few years later, when studying Rhætic fossils from the Napeng Beds of Burma, Miss Healey, referring to the occurrence in those beds of *Modiolopsis gonoides*, and recognizing the same shell in the Pahang Sandstones under my determination of *Pleurophorus elongatus*?, then stated that "this [identification] confirms Mr. R. B. Newton's opinion that the Myophorian Sandstone in which these casts occur is Rhætic or Upper Triassic."

For the present, therefore, we may consider the Singapore Beds as of Upper Trias or Rhætic age until better-preserved and more varied material is available to facilitate a greater accuracy of statement as to their true position in the Triassic Series.

Eastern Distribution of the Fauna.

	India.	Burma (Napeng).	Malay States (Pahang).	Singapore.	Indo-China.	New Caledonia.	New Zealand.	Alliances, &c.
Cephalopoda.								
[Ammonoid shell]	..	..	..	*	..	..	..	Fragment, with slight resemblance to *Balatonites* from the Muschelkalk.
Gastropoda.								
Promathildia colon (Wissmann)	..	..	..	*	..	..	..	Originally described from the St. Cassian Beds.
Pelecypoda.								
Lopha cf. *montis-caprilis* (Klipstein).....	..	..	..	*	..	..	..	Species belonging to the St. Cassian and Raibler Beds, and the Rhætic of France.
Chlamys cf. *valoniensis* (Defrance-Leymerie)..	*	..	*	*	..	..	..	Found in the British and European Rhætic.
Syncyclonema sp.	..	..	..	*	..	..	..	Probably related to *S. quotidianus* of Healey from Burma and Tonkin.

Spondylus dubiosus (Bittner)	..	..	..	*	..	..	..	A St. Cassian species.
Prospondylus comtus (Goldfuss)	..	..	..	*	..	..	..	European Muschelkalk.
Gervillia scrivenori, sp. n.	..	..	..	*				
Cassianella cf. *tenuistria* (Münster)	..	..	..	*	..	..	..	A St. Cassian species. The genus also occurs in Eastern countries (Tonkin, Burma, and New Zealand).
Cucullæa (?)	..	..	..	*				
Palæocardita cf. *crenata* (Goldfuss)	..	..	..	*	*	..	..	From the St. Cassian Beds of Europe and Indo-China.
Myophoria ornata, Wissmann	..	..	*	*	..	..	..	A St. Cassian species, and from Malay (Pahang).
—— cf. *goldfussi*, Alberti	..	..	..	*	*	..	..	From the European Muschelkalk and Indo-China.
—— *bittneri*, sp. mut.	..	..	..	*	..	..	..	A St. Cassian species, with affinities to *M. vestita*.
—— sp. indet. A	..	..	..	*				
—— sp. indet. B	..	..	..	*				
Schafhautlia astartiformis (Wissmann)	..	..	..	*	..	..	..	St. Cassian and Raibler Beds of Europe.
Opis cf. *hoeninghausi* (Klipstein)	..	..	..	*	..	..	..	A St. Cassian species.
Modiolopsis gonoides, Healey (= *Pleurophorus elongatus*?, R. B. Newton)	..	*	*	*	..	..	..	From the Rhætic of Pahang and Burma, and Indo-China.
BRACHIOPODA.								
[Terebratuloid shell]	..	..	..	*				
Spiriferina cf. *fragilis* (Schlotheim)	*	..	..	*	..	*	*	A European Muschelkalk species, found also in New Zealand and New Caledonia, with a doubtful occurrence in the Himalayas—showing probable Palæozoic affinities.

EXPLANATION OF PLATE IX.

(The figures are of natural size, except when otherwise marked.)

Lopha cf. *montis-caprilis* (Klipstein).

Fig. 1. Natural cast of a valve, showing internal features. Nat. size.
Fig. 2. An external view of a smaller example. Nat. size.

Chlamys cf. *valoniensis* (Defrance).

Fig. 3. } Three valves, showing slight variations in costal structure.
Fig. 4. } Nat. size.
Fig. 5. }

Syncyclonema sp.

Fig. 6. Natural cast of a valve of small dimensions. Nat. size.

Myophoria sp. indet. (A).

Fig. 7. Natural cast of a fragmentary form of this genus. Nat. size.

Myophoria sp. indet. (B).

Fig. 8. } Natural casts of left valves, showing the divergent carinations.
Fig. 9. } Nat. size.

Myophoria bittneri, sp. mut.

Fig. 10. External view of a left valve, taken from a plasticine squeeze of a matrix-cavity, showing the tubercled ornamentation and the postero-marginal ribbing. × 2.
Fig. 11. A similar valve of smaller size, taken from a plasticine cast. × 2.
Fig. 12. A fragmentary right valve, showing the same sculpture details, also from a plasticine cast. × 2.

Myophoria cf. *goldfussi*, Alberti.

Fig. 13. Small left valve, taken from a plasticine cast, exhibiting widely striated furrows and narrow costæ. × 2.

Myophoria ornata, Wissmann.

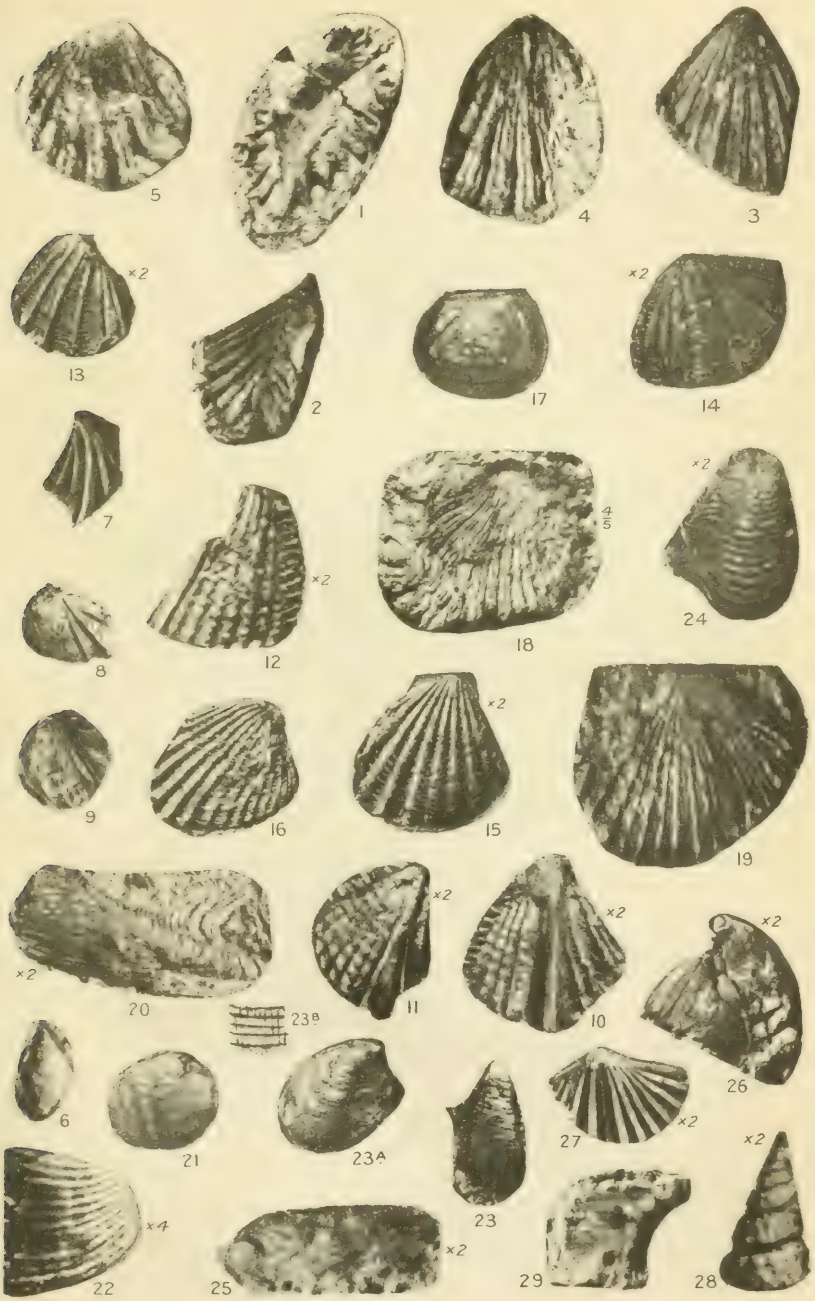
Fig. 14. External view of a left valve, taken from a plasticine cast, with indications of tubercles on the costal summits. × 2.

Spondylus dubiosus (Bittner).

Fig. 15. External view of a valve, taken from a plasticine cast, showing minute hinge-expansions and striated furrows. × 2.

Palæocardita cf. *crenata* (Goldfuss).

Fig. 16. External view of a fragmentary right valve, taken from a plasticine cast, possessing subacute ribs with crenated summits and transversely striated furrows. Nat. size.



P. Dollman, phot. R. B. Newton, direx.

MARINE TRIASSIC SHELLS FROM SINGAPORE.

Cucullæa (?).

Fig. 17. An imperfect natural cast of a probable left valve, equidistantly ridged and obscurely striated. Nat. size.

Prospondylus comtus (Goldfuss).

Fig. 18. Natural sandstone-cavity of a left valve. $\frac{4}{5}$ nat. size.
Fig. 19. Taken from a plasticine cast of the previous specimen, showing external features, including the auricular expansions, distant summit spines on the principal costæ, and the minutely granulated secondary ribs. Nat. size.

Gervillia scrivenori, sp. n.

Fig. 20. External view of a left valve, taken from a plasticine cast, exhibiting a deeply excavated posterior wing and a minutely granulated surface. × 2.

Schafhautlia astartiformis (Wissmann).

Fig. 21. From a plasticine squeeze of a matrix-cavity, giving external features of a left valve. Nat. size.
Fig. 22. Magnified portion of same specimen, showing concentric ridges. × 4.

Cassianella cf. *tenuistria* (Münster).

Fig. 23. Sandstone example, showing external features of a left valve with one of the auricles. Nat. size.
Fig. 23 *a*. Lateral view of same specimen. Nat. size.
Fig. 23 *b*. Magnified portion of surface-structure, which is quite microscopic.

Opis cf. *hoeninghausi* (Klipstein).

Fig. 24. Fragmentary right valve, taken from a plasticine squeeze, showing a deeply ridged and furrowed sculpturing and a widely sulcated posterior region. × 2.

Modiolopsis gonoides, Healey.

Fig. 25. A natural sandstone cast of an imperfect left valve, showing internal characters, with evidence of the adductor-scar impression in the anterior region. × 2.

(A Terebratuloid Shell.)

Fig. 26. A natural sandstone cast of an imperfect example, with the valves closed and *in situ*, showing internal characters. × 2.

Spiriferina cf. *fragilis* (Schlotheim).

Fig. 27. From a plasticine cast, exhibiting a small ventral (or larger) valve, with a deeply cut and radially ribbed surface. × 2.

Note.—This collection of fossils is preserved in the Geological Department of the British Museum, having been presented by Mr. J. B. Scrivenor.

XXXIV.—*Note on the Skull and Mandible of a Siberian Mammoth exhibited in the British Museum (Natural History).*

By C. W. Andrews, B.A., D.Sc., F.R.S.

(Published by permission of the Trustees of the British Museum.)

[Plate X.]

The fine skull and mandible of a Siberian mammoth described and figured in the present note were recently acquired by the Trustees of the British Museum by purchase from Messrs. Myers, ivory merchants, and are now exhibited in the Gallery of Fossil Mammals at the Natural History Museum. The exact locality from which the specimens came is not known with certainty, but probably it was the New Siberian Islands.

The skull, which is almost in the condition of a recent specimen, is practically perfect. The only parts damaged are: (1) the right side of the upper portion of the lambdoidal crest is somewhat crushed; (2) the right postorbital process is broken away; (3) the nasals are crushed and partly missing; (4) the side of the maxilla above the right molar tooth is broken away; (5) the postero-external border of the alveoli for the tusks is rather broken. On the left side, except for the loss of a part of the lachrymal the skull may be said to be perfect. The mandible, which (for reasons given below) probably does not belong to the skull, is much less complete, wanting the coronoid, articular and angular regions—in fact, all the jaw behind the sockets for the molars is missing.

The skull was evidently preserved in ice or frozen soil, for portions of the soft parts still remain, consisting mainly of frayed and fibrous remnants of ligaments, etc. These are best preserved on the occipital surface, where the *ligamentum nuchæ* is represented by a large fibrous mass more than an inch thick. Much ligament is also preserved on either side of the occipital condyles, in the neighbourhood of the articulation for the mandible, and on the base of the skull. The septum between the posterior nares is preserved. The ivory of the tusks is in an extraordinarily fresh condition, having lost so little of its elasticity that it could have been used for the manufacture of billiard balls, which in the case of mammoth ivory, I believe, very rarely happens.

In the same case is exhibited another tusk showing the more usual condition of fossil ivory from Siberia; this

specimen (M. 12238) was presented to the Museum by Messrs. Myers.

The skull shows all the peculiarities noted by Pöhlig * as characteristic of the mammoth. Some of the chief of these are (1) the long slender premaxillæ, with nearly parallel alveoli for the tusks, separated on the upper surface by a relatively narrow valley ; (2) the concave forehead and high vertex ; (3) the occurrence of an obtuse angle between the plane of the premaxillæ and that of the forehead ; (4) the large suborbital foramen ; (5) the prominent lachrymal and, especially, postorbital processes ; (6) the zygomata high up, with their ventral border nearly parallel to the wear-surface of the molars. When the plane of this wear-surface is produced forwards it cuts the premaxillaries at about their middle point. The skull, from its small size and from the slenderness of the tusks, can be referred with some certainty to a female.

The tusks, the perfect condition of which has already been referred to, are long and slender, showing the characteristic double curve. For the most part their surface is smooth, but for a short distance just outside the alveoli it is curiously eroded to such a degree that the diameter is reduced by about 5 mm. It seems possible that this erosion may be the result of some inflammatory condition of the gums, but, on the other hand, it may be due to some post-mortem causes. For the last 6 or 8 inches of the tip there is a well-defined flat surface of wear looking downwards and a little outwards.

The length of the tusks measured along the outside of the curve is 1930 mm., of which 460 mm. are within the sockets. The greatest diameter of the root is 87 mm., while just outside the alveolus the diameter is only about 80 mm. in consequence of the erosion mentioned above.

In the upper jaw the last (third) molars are in position and are already in an advanced state of wear, several of the anterior lamellæ having disappeared. All the remaining plates, fifteen or sixteen in number, are in wear, the twelve anterior ones having the wear-surfaces complete, while in the three posterior on one side and four on the other the figures are still discontinuous. The plates are very narrow and their enamel is thin ; the teeth are of the type usual in the Siberian mammoth. The length of the wear-surface is 152 mm., the width about 78 mm. Allowing two lamellæ to the worn anterior lobe, the total number of lamellæ in the length of the crown still present would be seventeen, and

* Pöhlig, "Monographie der *Elephas antiquus*, Falc. etc.," Nova Acta der Ksl. Leop.-Carol. Deutschen Akad. der Naturforscher, Bd. lvii. nr. 5 (1891), p. 365.

the quotient of the length divided by the number of lamellæ approximately 9, which is about the average for the thin-plated type of mammoth molar *. In one specimen from the Yenesei this number falls as low as 8·4, and probably still narrower-plated forms occur. The upper molars in our specimen do not seem to be quite normal, since their wear-surface is not gently convex as usual, but has a slight central concavity. This indicates that the lower molars must likewise have been somewhat abnormal in form in order that mastication should be possible ; and, since the molars of the mandible mounted with the skull have the ordinary slightly concave wear-surface, it seems probable that this lower jaw really belongs to a second specimen.

This belief is further supported by the fact that in front of the third lower molars there is a deep fossa, showing that the posterior part of the second molar was either actually in wear or had only lately dropped out ; this indicates that the animal to which the mandible belonged was younger than the owner of the skull in which the third molars were already in an advanced state of wear. The mandibular rami are rounded and massive, the symphysial groove nearly vertical, and the chin forms scarcely any projection.

The length of M. 3 (lower) is about 260 mm. in a straight line ; the length of the surface in wear is about 150 mm. and its width 87 mm. The number of the lamellæ is +14+ ; in seven of these the wear-surface forms a continuous band. The quotient of the length divided by the number of lamellæ is about 10. The plates and enamel seem to be distinctly thicker than the upper molars.

Whether the skull and mandible are associated or not, they are both typical specimens of the Siberian mammoth to which Depéret and Mayet † have recently applied the sub-specific name *E. primigenius sibiricus*.

A considerable number of mammoth skulls have been figured and described from time to time, and a summary of these descriptions up to the year 1891 will be found in Pöhlig's work referred to above (pp. 364–389). Several other skulls preserved in the museums of Stuttgart, Leipsic, and (?) Petrograd have since been described, but these all seem to have belonged to male individuals. Two of the skulls referred by Pöhlig to females most nearly resemble our

* According to the terminology employed by Mayet and others the "laminar frequency" of this tooth would be 11—that is to say, there would be about eleven plates in a space of 10 cm.

† "Les Eléphants Pliocènes," pt. ii., Annales de l'Université de Lyon, n. s. i. fasc. 42 (1923), p. 201.

SKULL AND MANDIBLE OF
ELEPHAS PRIMIGENIUS BLUMENBACH.
(about ¼ nat. size.)

specimen. One of these is from Mannheim and is figured by Pöhlig (*op. cit.* fig. 113, p. 366), the other figured by Pöhlig under the name *Elephas primigenius trogontherii* (*op. cit.* fig. 121, p. 386) is in Brussels, and is very similar in general form to our specimen, but the teeth indicate that it is a more primitive type. Both these specimens are larger than that now described.

Some approximate dimensions (in millimetres) of the skull now figured (M. 12328) are given below :—

Maximum total length	930
Distance from vertex to end of nasals (approx.)	371
Distance from vertex to ventral edge of occipital condyles	375
Greatest width at zygomatic arches	497
Least width of forehead	296
Width between ends of postorbital processes (approx.)	486
Width of premaxillary region at narrowest point	245
Width of premaxillæ at alveolar border	295
Width of skull at auditory openings	463
Width of nasal opening	298
Width between outer ends of occipital condyles	170

EXPLANATION OF PLATE X.

(By permission of the proprietors of the 'Illustrated London News.')

Skull and mandible of a mammoth, *Elephas primigenius*, Blumenbach. Frozen ground, Siberia. (M. 12328.) About $\frac{1}{14}$ natural size.

XXXV.—*Two new Collembola found in Britain.*

By James Meikle Brown, B.Sc., F.L.S., F.E.S.

While examining specimens of Collembola collected in various parts of the country, a number of species not yet described have been noticed. Two of these are described in the present communication.

Order COLLEMBOLA.

Suborder Arthropleona.

Family **Poduridæ.**

Achorutes strenuus, sp. n.

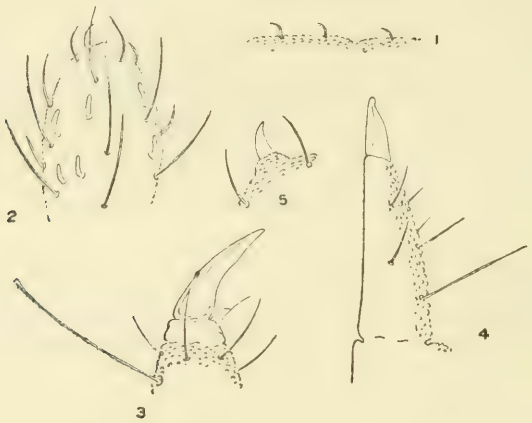
Dark blue-black, very strongly pigmented. Legs and spring coloured like the body.

Hairs short and sparse, the dorsal ones strongly curved backwards (fig. 1) ; a few longer and thicker ones at the

posterior end of the body, some of which are weakly serrate. Antennæ and legs with longer hairs.

Eyes eight each side, subequal. Postantennal organ small, about equal to the diameter of an eye, consisting of four tubercles arranged in a circle, and situated in a triangular area.

Antennæ $\frac{2}{3}$–$\frac{3}{4}$ the length of the head. Segment iv. with a club-shaped retractile papilla and six or seven short, thick, blunt olfactory hairs (fig. 2). Antennal organ iii. of two rod-like appendages.



Achorutes strenuus, sp. n.

Fig. 1.—Part of dorsal surface, showing hairs.
Fig. 2.—Terminal segment of antennæ, with olfactory hairs.
Fig. 3.—Apex of leg.
Fig. 4.—Dens and mucro.
Fig. 5.—Anal spine.

All highly magnified.

Legs with one tenent hair, long, strong, and weakly curved. Claw without inner teeth. Empodial appendage with broad inner lamina, half the length of the bristle, obliquely truncated at the apex; bristle half the length of the claw (fig. 3).

Spring well developed. Manubrium subequal in length to the dens. Dens with six dorsal bristles—two inner, two outer, and two median,—of which the basal one is very long (about $\frac{2}{3}$ the length of the dens), straight, and erect. Mucro almost $\frac{1}{3}$ the length of the dens and nearly $\frac{2}{3}$ that of the inner

edge of the claw of leg 3, with inner lamella gradually tapering and the ventral edge weakly curved (fig. 4).

Tenaculum with four barbs and no bristles on the ramus.

Anal spines $\frac{3}{5}$ the length of mucro, arising from tapering papillæ, which touch at their bases and are nearly equal in height to the spines (fig. 5).

Skin-granules small and numerous, those on the dorsal side of the dentes being similar to those of the body generally.

Size 1·4–1·8 mm.

Hab. and locality. On the face of the chalk-cliffs, Beachy Head, and on similar rocks nearer Eastbourne (Sussex), April 1919.

These small, very deeply pigmented insects were very numerous and active on the face of the rocks on Beachy Head in sunshine, and were found also, but in smaller numbers, on the rocks on and near the shore between this place and Eastbourne during Easter week.

A. strenuus resembles in general form and in the structure of the spring the common British species *A. purpurescens*, Lubb., but is easily distinguished from it by the number of tenent hairs, the structure of the olfactory organs, and in other minor characters. It bears considerable likeness to the Continental species *A. sahlbergi*, Reut. (4), differing from it in a number of details, such as the absence of teeth on the inner edge of the claw, the form of the mucro, and the curved shape of the anal spines. *A. sahlbergi*, further, is found among sphagnum. From *A. schäfferi*, Carl (2) = *A. affinis*, Schäff. (5), which has been taken in England by J. W. Shoebotham (7), it differs in the number of tubercles in the postantennal organ, the absence of an inner tooth to the claw, the length and form of the empodial appendage, the shape and size of the anal spines, and in the nature of the body-hairs. Our species is, further, distinctly smaller than these species.

According to the terminology of some Continental authors, this species should be named *Hypogastrura strenua*, sp. n.

Family **Entomobryidæ**.

Isotoma vestita, sp. n.

White, except for the eye-patch, which is deep purple-black, and a small pale purple mark situated anteriorly and posteriorly in the mid-line of the head. Apical segment of the antennæ pale violet, the colour fading gradually towards the basal segment, which is colourless.

Head and all the body-segments with a uniform covering of coarse, slightly curved, simple, almost adpressed hairs. In addition, each of the anterior abdominal segments with a median belt of six regularly arranged, long, erect, curved, doubly-feathered hairs, which are about equal in length to the dorsal length of the segments (fig. 6); rather more numerous and less regularly arranged on the posterior segments. The two posterior thoracic segments with similar, but shorter, more numerous, but less regularly arranged hairs. Legs with a similar strong feathered bristle on the basal segment. All other hairs simple.

Abdominal segments iii. and iv. subequal.

Antennæ rather longer than the head (about $1\frac{1}{4} : 1$).

Isotoma vestita, sp. n.

Fig. 6.—Portion of abdominal segments iii. and iv., showing hairs.
Fig. 7.—Apex of leg.
Fig. 8.—Mucrones: *a*, right (from above); *b*, left (from the outer side).
All highly magnified.

Approximate proportional lengths of the segments as 4 : 5 : 5 : 10.

Eyes eight each side, the third outer rather smaller than the others, which are subequal.

Postantennal organ broadly oval, about $1\frac{1}{2}$ times the diameter of an eye.

Legs without tenent hairs. Claw with small lateral tooth and a very minute inner tooth rather below the middle of the inner edge of the claw (this is difficult to see). Empodial appendage about $\frac{2}{3}$–$\frac{3}{4}$ the length of the claw, broadly lanceolate, with a minute tooth at the angle of the inner margin (fig. 7).

Spring just reaching the ventral tube. Manubrium dorsally with several fairly long simple setæ, ventrally with one strong curved outer bristle near the distal end. Dens three times the length of the manubrium, tapering, dorsally ringed, with fine hairs, dorsally erect, ventrally more numerous and more adpressed. Mucro about half the length of the empodial appendage of leg iii., with three teeth—a minute apical, a strong hook-like anteapical, and an equally strong hook-like outer tooth (in dorsal view the mucro appears to be two-branched, due to the position and length of the two prominent teeth) (fig. 8, *a* and *b*).

Tenaculum with four barbs.

Size ·8–1 mm.

Hab. In moss on the ground in woods.

Loc. Grindleford (Derbyshire), May 1923.

I. vestita is essentially different from any other British or Continental species. The character of the hairs and the structure of the spring appear to be quite characteristic. In the nature of the covering of hairs it approaches *I. tenuicornis*, Axels. (1 and 3), but differs considerably in detail, especially in the arrangement of the hairs, the size of the postantennal organ, the structure of the claws and mucro, and in the number of the eyes (six in this species).

The feathered hairs suggest at first sight *I. minor*, Schäff. (6), but in this species the arrangement of the hairs is different, eyes and postantennal organs are absent, and the form of the mucro is different. From *I. semenkewitshi*, Schtcs. (quoted from Linnaniemi (3)), another species with feathered setæ, it can be distinguished readily by the presence of a postantennal organ, and in the structure of the mucro. *I. muscorum*, Schäff. (5), is quite a different insect.

The specimens were obtained from ground-moss by means of the Berlese funnel in some numbers.

Literature cited.

(1) Axelson, W. M. 1903. "Weitere Diagnosen über neue Collembolen-Formen aus Finland." Acta Soc. F. et Fl. Fenn. xxv. no. 7. Helsingfors.

(2) Carl, J. 1901. "Zweiter Beitrag. zur Kenntnis der Collembolafauna der Schweiz." Revue suisse der Zool. ix. fasc. 2. Geneva.

(3) Linnaniemi (Axelson), W. M. 1912. "Die Apterygoten-fauna Finlands." Acta Soc. Scient. Fennicæ, xl. no. 5. Helsingfors.

(4) Reuter, O. M. 1895. "Apterygogenea Fennica." Acta Soc. F. et Fl. Fenn. xi. no. 4. Helsingfors.

(5) Schäffer, C. 1900. "Ueber württembergerische Collembola." Jahresh. d. Ver. f. Vaterl. Naturk. in Wurttemberg, lvi.

(6) ——. 1896. "Die Collembola der Umgebung von Hamburg &c." Mitth. aus. d. Naturhist. Mus. xiii. Hamburg.

(7) Shoebotham, J. W. 1911. "Some Records of Collembola new to England &c." Ann. & Mag. Nat. Hist. viii. London.

XXXVI.—*Diptera Nematocera from Rodriguez Island.* By F. W. Edwards. (*With an Introductory Note by* Hugh Scott.)

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Introductory Note.

The insects here enumerated form part of a large collection received at the Cambridge Museum in 1919, and made in Rodriguez between August and November, 1918, by Mr. H. P. Thomasset and Mr. H. J. Snell. The former had previously resided for many years in the Seychelles, and had given much assistance in the collecting of the fauna of those islands by the Percy Sladen Trust Expedition in 1905 and 1908–9 : the latter gentleman was in the service of the Eastern Telegraph Company. Mr. Thomasset was on a visit to Rodriguez, where he met Mr. Snell, in whom he aroused an interest in collecting, and whom he instructed in methods of preserving, insects.

The natural history of the island was discussed and a preliminary account of this collection of insects was given in a paper by H. J. Snell and W. H. T. Tams (Proc. Camb. Phil. Soc. xix. pp. 283–292, 1920). The only parts of the collection (besides that forming the subject of the present paper) so far reported on in detail are: Odonata, by H. Campion, Ann. & Mag. Nat. Hist. (9) xi. pp. 23, 24, 1923 ; Thysanoptera (in an addendum to the report on those from the Seychelles), R. S. Bagnall, Ann. & Mag. Nat. Hist. (9) vii. pp. 260, 286–289, 1921; and the following Coleoptera, the genera and species being in each case included in their proper systematic order in the same reports with the Seychelles material of these families, as follows: —

Endomychidæ, one species, G. J. Arrow, Ann. & Mag. Nat. Hist. (9) x. pp. 82, 83 (1922).

Scydmænidæ and *Phalacridæ*, each represented by a single species, H. Scott, Tr. Linn. Soc. London, ser. 2, Zool. xviii. pp. 195, 208–10, 239–40 (1922).

Tenebrionidæ, three species, H. Gebien, *t. c.* pp. 275–6, 314–15.

Elateridæ, one species, E. Fleutiaux, Tr. Ent. Soc. London, 1922, pp. 410, 411 (1923).

Cerambycidæ, eight species (out of twelve known from the island), C. Aurivillius, Ann. & Mag. Nat. Hist. (9) x. pp. 423 *sqq.* (1922).

No Nematocera (and only four species of the whole Order Diptera) were recorded from Rodriguez by F. Smith in his report on the Diptera obtained there by the 'Transit of Venus' Expedition (Phil. Trans. R. Soc. clxviii. extra vol., p. 538, 1879). In the present collection the Nematocera amount to fifteen species (five of them new), representing eleven genera and five families, Mycetophilidæ, Chironomidæ, Culicidæ, Simuliidæ, and Tipulidæ. Leaving aside a few species which could not be fully described owing to the condition of the specimens, it is remarkable that only two of the Rodriguez species, and these the common domestic mosquitoes of the tropics (*Aëdes argenteus* and *Culex fatigans*), are also known from the Seychelles. The Nematocera of the latter islands have been fairly thoroughly worked out in the reports of the Percy Sladen Trust Expedition *, and a complete series of specimens is to hand for comparison in the British Museum. Nearly all of the Rodriguez genera are represented in the Seychelles, but by different species: e. g., *Simulium* has a single species in Rodriguez and a single, quite distinct, representative in the Seychelles; *Probezzia* is represented in the Seychelles by four species, and in the Rodriguez collection by one species, quite distinct from any of those four. The Seychelles are nearly 1200 miles distant from Rodriguez, a little west of north. On the other hand, one of the Rodriguez Tipulidæ is referred to a species previously known only from the coral-atoll of Aldabra, which lies some 240 miles N.W. of Madagascar, and about 1300–1400 miles N.W. of Rodriguez. One would naturally seek for affinities with the fauna of Rodriguez in Mauritius and Réunion, which lie between 350 and 500 miles to the west, but I am not aware that any data are forthcoming with regard to the Nematocera of the last-named islands.

Types or co-types of the new species will be placed in the British Museum.—H. S.

Mycetophilidæ.

Sciara spp.

Two female specimens apparently representing distinct species, but with no striking distinguishing features.

* A list of the reports, with full references, will be found in Ent. Mo. Mag. 1922, p. 184.

Chironomidæ.

Dasyhelea sp.

One damaged specimen. [A Seychelles representative of this genus was described by Kieffer under the name *Ceratopogon trichotomma*, Tr. Linn. Soc. London, ser. 2, Zool. xiv. p. 332, Sept. 1911.]

Probezzia sp.

One headless specimen, not fit to describe, but clearly distinct from any of the four species described by Kieffer from the Seychelles (*op. cit.* pp. 348–350, Sept. 1911).

Chironomus spp.

One male of one species, and three females of a second; none in a fit state for description, but almost certainly belonging to different species from any of those known from the Seychelles.

Cricotopus rodriguensis, sp. n.

Head shining black; antennæ and palpi black. Eyes very widely separated and only slightly emarginate; pubescence short but distinct. Last segment of ♂ antennæ equal in length to the remainder of the flagellum. Antennæ of ♀ 6-segmented, the second segment somewhat swollen and very slightly constricted beyond the middle; last segment pointed, with small apical bristle, nearly as long as the three preceding segments together. *Thorax* black, entirely shining except for the scutellum, which is somewhat dull; pleura somewhat brownish. *Abdomen* with the first tergite shining leaden-grey; second and third similar, but with broad velvet-black apical bands; fourth with a similar but much narrower band; fifth, sixth, and eighth almost entirely velvet-black; seventh mostly shining leaden-grey. Male hypopygium with the basal half of the side-pieces blackish, apical half and the rather broad claspers whitish. Female lamellæ white. *Legs*: posterior two pairs yellowish, femora and tibiæ blackened at the tips. Front femora yellowish, with the tips broadly black; tibiæ blackish with a white ring near the base and occupying about one-third of the length of the tibia, its outer edge in some specimens ill-defined; front tarsi blackish. Pulvilli present, but very small, only about one-third as long as the claws; empodia not much shorter than the claws. First segment of front tarsi three-fifths as long as the tibia. *Wings* with a slight

brownish tinge (slightly milky by reflected light); veins dark, especially the thick cross-vein. Costa extending slightly beyond tip of R_{4+5} in the ♂, distinctly so in the ♀. Halteres yellow. Wing-length about 1·8 mm.

Cotypes, 3 ♂, 11 ♀.

This genus seems to be poorly represented in both the Ethiopian and Oriental regions. Among the small number of published descriptions, I do not find one which agrees at all closely with the specimens before me. The Seychelles species of this genus, described by Kieffer as *Trichocladius quadrifasciatus* (op. cit. p. 360), is very different in colour, besides having no pulvilli.

Culicidæ.

Aëdes argenteus (Poiret) (*Stegomyia fasciata*, Fabr.).

One female.

Culex fatigans, Wied.

One female.

Culex simpsoni, Theo.

One female, exhibiting all the characters of this East African species, though in the absence of a male the determination must be regarded as provisional. The species has been reported from Zanzibar, but otherwise has not previously been reported from outside the African continent.

Simuliidæ.

Simulium diversipes, sp. n.

Head: antennæ slender, almost entirely reddish in both sexes, only the first flagellar segment darkened. Palpi black. Face in ♂ silvery-grey. Face and frons in ♀ pale greyish, rather densely covered with coarse, pale, almost silvery pubescence; front of average breadth. *Thorax* in ♂ dark greyish, with three very broad and practically confluent black stripes, the middle one reaching the front margin, the lateral pair much abbreviated; the mesonotum is clothed with coarse and rather dense pubescence, pale on the grey areas, dark brown on the black stripes. In the ♀ there is no trace of black stripes on the mesonotum, and the pubescence is almost uniformly pale, only a little darker in the middle. Membranous area of pleura bare. *Abdomen* dark, clothed with rather dense pubescence, which in the ♂

is ochreous, in the ♀ whitish. Hair on first segment yellowish. Hypopygium of ♂ very similar in structure to that of the European *S. angustitarsis*, Lundst., but the claspers a little broader towards the truncate tips; as in all the *aureum* group, the "arms" of the ædeagus carry each a single bent spine. *Legs* with the coxæ yellow; femora yellow, the front pair with the tips slightly darkened, the posterior pairs with the tips broadly black; tibiæ yellow with a dark ring near the base, and with the tips broadly black, the dark markings less extensive on the front legs, and more extensive in the ♂ than in the ♀, the posterior tibiæ of the ♂ having about the apical half black; tarsi blackish, the first segment of the hind tarsi yellowish, gradually darkened on the apical third or half. Front tarsi almost cylindrical; first segment of hind tarsi very little enlarged in either sex. Claws of ♀ with a well-marked basal thumb, over half as long as the claw itself. *Wings* normal. Halteres yellow. Wing-length: ♂ 2, ♀ 2·3 mm.

Cotypes, 6 ♂, 1 ♀.

This evidently belongs to the *aureum* group, but seems well distinguished by the colour of its antennæ and of the pubescence on the thorax of the male. It has several fairly close allies in the African fauna.

Tipulidæ.

Limnobia discobolina, sp. n.

♀. *Head* ochreous behind and on the very narrow front; area just above the antennæ blackish, dusted over with white. Antennæ black, the second segment obscurely brownish. Flagellar segments decreasing in size towards the tip, nearly globular, except the last three or four, which are more oval; last segment constricted just beyond the middle, and almost divided into two. Verticils short, barely as long as the diameter of the segments. Proboscis and palpi black. *Thorax* with the ground-colour dull ochreous, dusted over with whitish; præscutum with four dark stripes, obsolete anteriorly, the inner pair darker than the outer. Scutum with two blackish stripes. Scutellum yellowish in the middle; blackish at the sides; postnotum blackish in the middle and at the base and apex. Ill-defined dark markings on the mesepisternum, and a rather ill-defined dark vertical stripe extending along the posterior edge of the sternopleura and upwards to behind the base of the wings. *Abdomen* dull ochreous, the first few tergites margined with black laterally. Ovipositor short. *Legs* with the coxæ and

trochanters greenish. Femora ochreous, becoming darker beyond the middle; extreme tip and a rather narrow subapical ring dark brown, a distinct pale ochreous ring on each side of the dark ring. Tibiæ ochreous with the tip black. Tarsi dark. Claws with three or four teeth, the outer one much the largest. *Wings* with the ground-colour very pale yellowish, veins mostly greenish. A conspicuous pattern of dark circles (more or less irregular) surrounding darkened pieces of vein, the most conspicuous being those at the base of *Rs*, tips of *Sc* and R_1, apex of discal cell, and tips of Cu_2, *An*, and *Ax*. In addition to these there are irregular dark marks about the apex of *Rs*, near the tips of R_{2+3} and R_{4+5}, at the tips of M_1, M_2, and Cu_1, on the hind margin at each side of the anal angle, and near the bases of the basal cells. *Sc* ending above apex of *Rs*; *Rs* strongly curved at the base; Cu_1a at base of discal cell; tip of R_1 turned upwards and a little shorter than *r*; R_{2+3} and R_{4+5} curved downwards somewhat towards the tip. Halteres ochreous, tip of stem darker. Wing-length 12 mm.

A single ♀.

This species is remarkable for the rather close resemblance of its wing-markings to those of *Discobola argus*. It is, however, a true *Limnobia* without a trace of the cross-vein connecting *An* and *Ax*.

Dicranomyia (?) *monochromera*, sp. n.

Head greyish, more ochreous on the narrow front. Antennæ with the scape ochreous, first segment more or less darkened; flagellum black, except the last segment, which is ochreous, contrasting strongly with the rest; all the flagellar segments approximately globular and nearly equal in size. Palpi blackish. *Thorax* dull ochreous, the scutellum, postnotum, and pleura more greyish; the only marking on the thorax is a brown patch or stripe across the mesepisternum and the upper part of the sternopleura, most conspicuous when viewed from in front. *Abdomen* dull ochreous, without definite markings. Hypopygium of the usual type, rather small and short; ninth tergite broad and slightly emarginate; fleshy claspers about as long as the side-pieces; rostrum without spines. Ovipositor moderately short. *Legs* ochreous, the tips of the femora indistinctly darkened. Claws with two teeth near the base, the inner one very minute. *Wings* rather opaque, pale greyish; veins ochreous, except the cross-veins, the base of *Rs*, and the tips of *Sc* and R_1, which are darkened; a slight dark cloud in the base of cell *An*, otherwise there are no wing-markings.

Sc ending before the middle of *Rs*; Sc_2 at or slightly beyond the base of *Rs*. R_1 running almost straight to the costa, its terminal section 2–3 times as long as *r*. *Rs* straight, short, a little shorter than the first section of R_{2+3}. R_{4+5} considerably bent downwards at the tip; *r-m* short. Cu_1a at base of discal cell. *Ax* some distance before its tip with a short vein-stump extending towards *An*, this stump dark and surrounded by a slight dark cloud. Halteres with whitish stem and black knob. Wing-length: ♂ 14, ♀ 9–12·5 mm.

Type ♂ and 6 ♀.

This species is very distinct on account of the ochreous terminal segment of the antennæ and the stump on *Ax*. The last-mentioned character is of interest for comparison with the complete cross-vein in this position, which characterizes the genus *Discobola*.

Dicranomyia rodriguensis, sp. n.

Head dark grey, unmarked. Front narrow. Antennæ with the scape brownish, flagellum black: flagellar segments mostly rounded, the last few more oval: verticils about as long as the diameter of the segment. Palpi and proboscis black, the latter about half as long as the head. *Thorax* entirely dark, heavily dusted with ochreous-grey except for a rather broad median stripe on the præscutum, which is dark brown and very conspicuous when seen from in front. *Abdomen* dark above, lighter below. Hypopygium: ninth tergite small, rounded apically. Side-pieces with a short projection near the base on the inner dorsal aspect, bearing two or three spines at its tip: the usual ventro-basal projection is forked, its inner branch slender and bare except at the tip: midway between this and the small dorso-basal projection is another long finger-like projection, bare except for some long hairs at its tip: rostrum broad at the base, with two short spines a little before the tip, at the base on the inner side with a small tubercle bearing a tuft of hairs. *Legs* ochreous: tarsi darker towards the tips; femora with a faint subapical dark ring. Claws with a small median tooth. *Wings* nearly clear; a small but distinct dark cloud over the arculus: a rather large round dark spot over the apex of *Sc* and the base of *Rs*, equal in size to the round stigma: a smaller dark spot over the apex of *Rs*; cross-veins slightly clouded. Sc_2 close to tip of *Sc*; *r* a little longer than the turned-up tip of R_1; *Rs* obtusely angled near the base, nearly three times as long as the first section of R_{2+3}; R_{2+3} and R_{4+5} running straight to the margin;

Cu$_1$*a* placed a little before the base of the discal cell, which is twice as long as broad. Halteres moderately long, light in colour. Wing-length 4·5–6 mm.

Type ♂ and 2 ♀ ♀.

In many respects this species bears a considerable resemblance to *D. puncticosta*, Brun., which is widely distributed in the Oriental region, but the coloration of the thorax is quite different, as well as the details of hypopygial structure.

Gonomyia (*Ptilostena*) *aldabrensis* (Edwards).

Thaumastoptera aldabrensis, Edwards, Tr. Linn. Soc. London, ser. 2, Zool. xv. p. 205, pl. x. fig. 10 (1912).

One damaged female, apparently belonging to this species, which was described from Aldabra.

Ctenacroscelis albovittatus (Macq.).

Although not represented in the present collection, a female of this species was obtained by Gulliver on the 'Transit of Venus' Expedition in 1876 (but was not recorded till now). The specimen is in the British Museum. *C. albovittatus* is widely spread in Africa, but has not been obtained in the Seychelles, where, in spite of the much larger Tipulid fauna, the whole subfamily Tipulinæ appears to be unrepresented.

XXXVII.—*New Parasitic Hymenoptera.*

By G. T. Lyle.

Chelonus rufus, sp. n.

Head and thorax usually black, though sometimes the metathorax is dull rufous and the pleuræ are also tinged with rufous. Abdomen rufous, somewhat darkened posteriorly from about the middle. Legs rufo-testaceous; coxæ and trochanters fuscous or blackish; fore femora at base, middle excepting apex, and hind entirely, apical third of hind tibiæ, a band near base of the same, and all the tarsi apically fuscous or blackish (occasionally the middle tibiæ also are basally dark). Head rugose; clypeus smooth, elevated and shining with scattered punctures; antennæ fuscous, darker basally, 27-jointed in male, 24–25-jointed in female. Body somewhat coarsely rugose, scutellum more finely so than the rest. Metathorax short, abruptly truncate, with a prominent denticle at either lateral angle. Sutures of mesothorax subobsolete. Abdomen scarcely longer than head and thorax,

obtuse at apex (especially in the male), with faint traces of the usual basal carinæ; terebra very short. Wings subhyaline, stigma and nervures fuscous, parastigma testaceous; radial cell but little larger than stigma; third abscissa of radius slightly curved, radius of hind wing sinuate.

Length 5 mm.; alar expanse 8 mm. ♂ ♀.

Described from a pair bred at Lyallpur, Punjaub, 16/5/20 and 12/6/20, from white cocoons found on cotton. The cocoons accompany the specimens, and are said to be those of a species of *Earias*. On this point, however, further evidence would be welcome, for, so far as I am aware, it is foreign to the habits of the Chelonidæ to emerge from the cocoons of their hosts; one of the cocoons I cut open, but found therein no trace of a second cocoon such as is spun by all larvæ of Chelonidæ of whose habits we know anything. The cocoons have a length of 8–9 mm., and, beyond being rather large for the parasite in question, are similar to those made by other species in this genus.

I have also examined four other examples which were bred by D. Rath from *Laphygma exigua* on lucerne, Punjaub, Aug. and Sept. 1919.

Chelonus rugulosus, sp. n.

Black; palpi testaceous, mandibles rufo-testaceous; trochanters, fore and middle femora excepting base, hind femora at apex, and fore tibiæ rufo-testaceous, hind tibiæ black, with a central rufous band; all the tarsi fuscous, but inclined to be basally paler; coxæ black, with the apex rufo-fuscous. Head somewhat feebly punctato-rugulose; clypeus elevated, smooth, shining, punctate; orbits striate. Mesothorax, pleuræ, and metathorax coarsely punctato-rugose; scutellum smooth, shining, punctate. Metathorax quadridentate, an acute denticle at either lateral angle, and two much shorter intermediate teeth. Wings subhyaline, stigma fuscous, nervures paler; second abscissa of radius shorter than first, third abscissa short, almost straight; radius of hind wing regularly curved. Abdomen coarsely rugose, somewhat elongate, smooth and shining at apex. Terebra short, not surpassing apex of abdomen.

Length 4 mm. ♀.

In the specimen I have described, unfortunately, both antennæ are broken off near the base of the flagellum.

Described from a single female bred by H. W. Simmonds from cotton-bolls affected with pink bollworm. Rabula, Fiji, 22/8/22.

Type in British Museum.

Ascogaster elongata, sp. n.

Black, palpi testaceous; coxæ at extreme apex, all femora at apex, fore and middle tibiæ entirely, and hind tibiæ centrally above testaceous; tarsi fuscous. Head, mesothorax, and scutellum punctulate; metathorax rugulose, short, truncate, with two irregular, divergent, central carinæ, unarmed. Mesothoracic sutures broad and shallow. Antennæ 34- or 35-jointed, shorter than body. Wings subhyaline; stigma and nervures fuscous; second abscissa of radius a little shorter than first, third abscissa almost straight, radial cell but little larger than stigma, recurrent nervure interstitial; radius of hind wing sinuate. Abdomen basally shouldered, elongate, quite three times as long as its greatest breadth, punctulate, smooth and shining at its somewhat pointed apex, without basal carinæ. Terebra slightly exserted. ♀.

Length 4 mm.; alar expanse 7 mm.

Described from a single female taken at Lake Luna, 22/10/19.

Type in British Museum.

Ascogaster obscurator, sp. n.

Black; palpi, extreme base of first joint of flagellum, and mandibles excepting tips testaceous. Legs dull rufo-testaceous, hind tibiæ darker at apex, tarsi somewhat paler, claws and coxæ black. Wings infumated, with a very distinct narrow white streak reaching from the junction of stigma and parastigma across the first cubital cell to the point where the recurrent nervure falls into the second cubital cell, and thence following that nervure almost to the inner margin of the wing. Stigma and nervures dark fuscous; first discoidal cell shortly petiolated; third abscissa of the radius almost straight, second slightly longer than first; radius of hind wings sinuate; radial cell of hind wing showing signs of a gemmating transverse nervure. Head striato-punctate; face with an obtuse central carina reaching from the clypeus to base of antennæ; clypeus punctate; antennæ 32-jointed. Body coarsely rugose, with mesothorax, pleuræ, and scutellum somewhat smoother than the rest, metanotum on either side of apex of scutellum quite smooth; metathorax with a central longitudinal carina and a denticle at either lateral angle. Abdomen obtuse. Mesothoracic sutures broad and deep (the thorax is much damaged by pinning). ♂.

Length 5 mm.; alar expanse 10 mm.

Described from a single male taken at Tisbury, N.Z., 25/12/17.

Type in British Museum.

XXXVIII.—*A new Ratel from British East Africa.*

By Oldfield Thomas.

The British Museum owes to Mr. Marius Maxwell a number of valuable photographs and specimens of large game, and in company with these he has presented examples representing a new species of ratel, which I would propose to term

Mellivora maxwelli, sp. n.

Size comparatively small. Coloration of mantle uniform dark grizzled grey, the darker grey extending mesially from the nape to the tail without change of tone, and flanked on each side with a fairly well-defined white line, continuous with the white of the crown.

Skull markedly different in shape from that of any other form. Small, comparatively low, the brain-case "poorly filled," narrow, and not inflated or convex upwards. Postorbital processes prominently projecting. Intertemporal area long and parallel-sided. Mastoid projections strongly developed, the mastoid breadth unusually great and considerably exceeding the zygomatic.

Teeth of normal proportionate size.

Dimensions of the type:—

Head and body (from remade skin) about 630 mm.; tail about 180.

Skull: condylo-basal length 117·5; zygomatic breadth 65; interorbital breadth 27; breadth across postorbital processes 33; intertemporal breadth 25; mastoid breadth 69·7; height of skull at bullæ 45; length of bulla 29; p^4, length on outer edge 12; greatest oblique diameter 12·6.

Hab. Kenya Colony. Type from the Lorian Swamp.

Type. Old female. B.M. no. 22. 11. 24. 2. Collected and presented by Mr. Marius Maxwell. A male skin, without skull, also presented.

This remarkable little ratel has a skull noticeably different in shape from that of the ordinary forms. Comparing it with a more normally shaped skull, its mastoid breadth is 59 % of its condylo-basal length, as against 55, and the height of its brain-case is only 38·3 % of the same length, as against 46—a very material difference.

I have much pleasure in naming it in honour of its captor, to whom the National Museum is greatly indebted for many important donations in the domain of Big Game.

XXXIX.—*Two new Mammals from Marajó Island.*

By Oldfield Thomas.

Among the mammals collected by Mr. W. Ehrhardt on Marajó Island, at the mouth of the Amazon, there are examples of the following new forms—a bat and an aguti :—

Eumops delticus, sp. n.

Size about as in *E. bonariensis*, therefore larger than in *E. nanus* and smaller than in any other known species.

External characters apparently quite as in *bonariensis*, except that the under surface is less distinctly washed with greyish.

Skull long, low and slender, with less broadened and inflated brain-case than in *bonariensis*, the shape more like that of *nanus*. Top of crown with scarcely any trace of sagittal crest.

Teeth about as in *bonariensis*, except that the canine is larger in section and extends backwards to touch the large premolar, and thus completely shuts out the minute premolar into the outer angle between the two. Below, the anterior premolar is more closely crushed between the canine and posterior premolar.

Dimensions of the type :—

Forearm 47 mm.

Head and body (measured in flesh) 68 ; tail 41 ; ear 19. Third finger, metacarpal 48, first phalanx 20.

Skull : greatest length 18·2 ; condyle to front of canine 17·1 ; mastoid breadth 10 ; intertemporal breadth 4·1 ; front of canine to back of m^3 7·2.

Hab. Marajó Island. Type from Caldeirão.

Type. Adult female. B.M. no. 23. 8. 9. 7. Original number 88. Collected 14th January, 1923, by W. Ehrhardt. Presented by Oldfield Thomas.

This bat seems to be only nearly allied to *E. bonariensis*, Pet., as its skull is decidedly larger than that of the little *E. nanus*, Mill., while all the other species are very much larger again.

Dasyprocta aguti maraxica, subsp. n.

General characters of *D. aguti*, and perhaps most like

D. a. lunaris, but the colour very much warmer anteriorly, the withers, shoulders, and fore-back of a warm grizzled tawny, not conspicuously colder than the rump, which is of the usual flaming ochraceous; indeed, the area halfway along the neck is as richly coloured as the rump, though of a more tawny tone. Rump-hairs with one or two subterminal black rings. Head and limbs grizzled tawny, again much warmer than in the allied forms; toes not blackened. Under surface strong grizzled yellowish, without the marked mesial line characteristic of the Brazilian *D. a. aguti.*

Dimensions of the type :—

Head and body 510 mm.; tail 27; hind foot 96; ear 41.

Skull: greatest length 103; condylo-incisive length 89; upper tooth-series 16.

Hab. Marajó Island. Type from Caldeirão.

Type. Adult male (p^4 worn). B.M. no. 23. 8. 9. 10. Original number 85. Collected 13th January, 1923, by W. Ehrhardt. Presented by Oldfield Thomas.

Readily distinguishable from other members of the *aguti* group by the more strongly tawny colour of the anterior half of the body. Wagler's *D. croconota,* as figured by Wagner, has the usual brownish fore-back and light centre of belly characteristic of true *aguti,* of which it may be an Amazon representative. Indeed, a specimen from the Rio Tapajoz in the Museum agrees very closely with its description.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

May 16th, 1923.—Prof. W. W. Watts, Sc.D., F.R.S., Vice-President, in the Chair.

The following communications were read :—

1. 'The Upper Ordovician Rocks of the South-Western Berwyn Hills.' By William Bernard Robinson King, O.B.E., M.A., F.G.S.

The district described lies in the south-eastern corner of the 1-inch Ordnance Survey Map, Sheet 136 (Bala). The area is one where the beds strike in a north-easterly and south-westerly

direction, with dips nearly vertical. The general succession is as follows:—

Salopian ...	Mudstones and grits.
Valentian	(*a*) Pale-grey mudstones. (*b*) Wavy bedded sandy shales, passing down into (*c*) Massive fossiliferous sandstone, which yields *Meristina crassa* [15 feet].
	Unconformity.
Ashgillian	(*a*) Leaden-blue mudstones, containing *Trinucleus* [50 feet]. (*b*) Sandy mudstones yielding a new species of *Calymene* and higher *Phillipsinella* Beds [1000 feet], fossiliferous throughout. (*c*) Dark-blue calcareous mudstones containing a rich *Phillipsinella* fauna [15 feet], following conformably upon
Caradocian	(*a*) Black graptolite-shales, with black limestone and an 18-inch phosphate-band [50 feet]. (*b*) Calcareous ashes and mudstones yielding *Orthis actoniæ*. (*c*) Sandstones and sandy mudstones containing *Orthis alternata*, with an ash-band in the south and west.

It is thought that the black graptolitic shale group is of shallow-water, probably lagoon, origin. The *Meristina-crassa* Sandstone sometimes rests upon the *Trinucleus* Mudstones, and sometimes upon the lower sandy beds: it appears to be unconformable to the Ashgillian. The fauna found in the sandstone is peculiar, some elements being of normal Lower Valentian type, while others are found in the Hirnant Limestone of Bala.

Correlation is made with the neighbouring districts of Glyn Ceiriog, Bala, and Welshpool.

The area appears to have been one of shallow water throughout Upper Ordovician times, and actually became land at the end of that period. The gap in the succession occasioned by this uplift was greatest in the south-east, near Welshpool; while the areas on the north (Glyn Ceiriog) and west (Bala) remained under the sea. The shallowing of the water in these areas is, however, manifested by the deposition of either gritty beds or oolitic limestones.

A new species of *Calymene* is described from the upper part of the Ashgillian, where it is taken as a local index-fossil.

2. 'The Geology of the District around Corris and Aberllefenni (Merioneth).' By Prof. William John Pugh, O.B.E., B.A., F.G.S.

In this paper the Author describes the succession and structure of an area of about 25 square miles, lying south-east of Cader

Idris. The area has been surveyed on the scale of 6 inches to the mile. The work of previous investigators, including Sedgwick, Ramsay, and Davies, is dealt with.

The rocks are partly Lower Silurian and partly Upper Ordovician in age. The Valentian succession is similar to that described at Machynlleth,[1] and the same classification is retained. The Upper Ordovician rocks are classified as follows:—

Bala Series.	Abercorris Group.	(3) Garnedd-wen Beds.	Mudstones, with gritty and conglomeratic bands.
		(2) Narrow Vein.	Dark-blue slate.
		(1) Red Vein.	Dark-blue, rusty-weathering mudstones.
	Abercwmeiddaw Group.	Broad Vein.	Greyish-blue, mottled mudstones.
	Hengae Group.	(2) Nod Glas.	Black shales and mudstones.
		(1) Ceiswyn Beds.	Greyish-blue slaty mudstones, with dark slates at the base.
Llandeilo	Craig-y-Llam Group.	Rhyolitic lavas and ashes.	

The Bala Series is described in detail. The Ceiswyn Beds have yielded a few ill-preserved graptolites, but the Nod Glas contains a rich graptolitic fauna, including *Dicranograptus clingani*, *Dicellograpti*, *Diplograpti*, etc., and the general aspect of the fauna suggests that it may represent the junction between the zones of *Dicranograptus clingani* and *Pleurograptus linearis*.

The Abercwmeiddaw Group has yielded an interesting shelly fauna, including *Trinucleus albidus*, three species of *Cyclopyge*, *Christiania tenuicincta*, etc. The fauna recalls that of the *Dionide* Band in the Upper Whitehouse Group at Girvan.

The Abercorris Group corresponds to the zone of *Dicellograptus anceps*, and that form is recorded from the Red Vein. The Garnedd-wen Beds rapidly diminish in thickness, when followed along the strike to the north-east.

The Valentian is considered to rest conformably upon the Bala Series.

The general strike, from south-west to north-east, is determined by the fact that the area lies on the south-eastern flank of the Harlech Dome; but the district is crossed by important folds transverse to the normal strike. These structures have been correlated with those described farther south at Machynlleth.

The succession established in the Upper Ordovician rocks is compared with that at Plynlimon, Bala, Girvan, and Conway.

[1] O. T. Jones & W. J. Pugh, Q. J. G. S. vol. lxxi (1915–16) p. 343.

THE ANNALS

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[NINTH SERIES.]

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XL. — *A Revision of the Old World Cyrtacanthacrini* (*Orthoptera*, Acrididæ).—III. *Genera* Valanga *to* Patanga*.

By B. P. Uvarov, F.E.S., Assistant Entomologist, Imperial Bureau of Entomology.

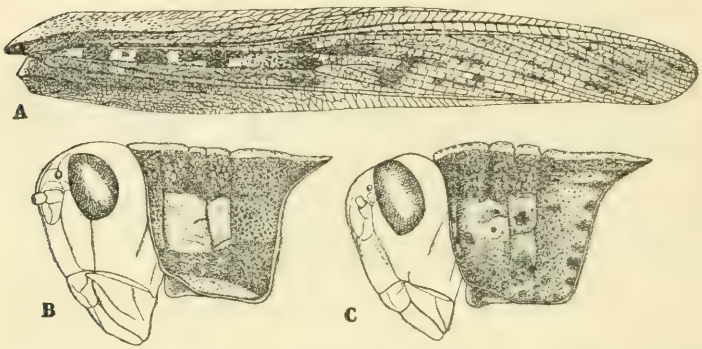
XIV. Genus Valanga, nov.

Frontal ridge in profile somewhat reclinate, straight; seen from the front it is parallel-sided, or practically so, very indistinctly narrowed at the fastigium; its surface finely punctured, impressed below the ocellum; margins smooth, reaching the clypeus. Fastigium of vertex distinctly sloping, feebly impressed; margins scarcely raised, punctured. Eyes strongly prominent, oval, less than twice as high as long; subocular distance exceeds somewhat their length; distance between the eyes half as broad as an eye is long and subequal to the width of frontal ridge. Pronotum more or less tectiform, compressed laterally and more or less constricted in the metazona; median keel thick; surface very coarsely punctured in prozona and more thinly, but densely, in metazona. Elytra not long, fairly broad, transparent almost throughout; apex rounded. Hind femora short and thick; apical part hardly attenuate. Male cerci strongly laterally

* Part I., Ann. & Mag. Nat. Hist. (9) xi. p. 130 (1923); Part II., *ibid.*, p. 473.

compressed, with the apex attenuate and more or less decurved and incurved. Prosternal spine laterally compressed, slightly inclined and bent backwards, but widely separated from the mesosternum.

Fig. 8.



A, B. *Patanga succincta*, L.; C, *Valanga nigricornis* (Burm.). × 3, except fig. A, which is × 1·5.

A perfectly natural genus, which is represented by a large number of closely allied species ; in some cases they are, in fact, so close to each other that I prefer to regard them as geographical races (subspecies) of one species. There is no doubt that there remain still many undescribed species and subspecies on the various islands of the Indian and Pacific Oceans. The following key is necessarily artificial.

Key to the Species and Subspecies.

1 (38). Prozona of the pronotum distinctly longer than the metazona.

2 (3). Prozona much longer than metazona; the latter equal in length to the distance between the front margin and the second sulcus. Male cerci short, scarcely incurved, feebly narrowed posteriorly, with the apex strongly decurved. Frontal ridge in profile slightly concave just below the ocellum. Pronotum thick; prozona strongly convex ; metazona depressed, almost flat, very obtusely angulate. Elytra extending scarcely beyond the hind knees. Brown or brownish ochraceous; antennæ pale; elytra with indefinite dark spots; hind femora

with two upper fasciæ and rows of dark spots along the carinæ of the area externomedia; hind tibiæ fleshred; their spines orange; wings hyalinous or faintly infumated. (Queensland.) ..... 1. *meleager* (Sjöst.).

3 (2). Prozona not much longer than the metazona; the latter distinctly longer than the distance between the front margin and the second sulcus.

4 (31). Pronotum with its fore margin entire.

5 (20). Wings with the base rose.

6 (19). Wings slightly or moderately infumate.

7 (16). Hind tibiæ from above not red nor reddish.

8 (9). Hind tibiæ from above black or bluish black; their spines yellow. General coloration yellow or greenish yellow, with heavy black (or bluish-black) markings on the head, pronotum, and hind femora. Pronotum very coarsely punctured, strongly convex, with the median keel thick, convex in profile. Elytra unicolorous or with indefinite dark spots. (Singapore, Penang.) .. [*cornis* (Burm.). 2 *a. nigricornis nigri-*

9 (8). Hind tibiæ from above bluish or greenish grey. Median keel of the pronotum sharp. Pronotum unicolorous or not heavily marked with black from above, but not on the lateral lobes. Hind femora unicolorous or with but faint markings.

10 (13). Spines of the hind tibiæ orange. General coloration brown, sometimes with greenish design on the pronotum.

11 (12). Larger. Elytra in the basal half with fairly large, round spots, sometimes obsolete. Pronotum uniformly brown or with a median fascia and the hind margin greenish. Wings slightly infumate, with the base very pale rose. (Isl. Allor.) ..... [*rensis*, subsp. n. 2 *b. nigricornis allo-*

12 (11). Smaller. Elytra in the basal half with but very indefinite and confluent spots. Pronotum unicolorous ochraceous-brown. Wings distinctly infumate, with the base rose. (Philippines.) .. [(Walk.). 2 *c. nigricornis fortis*

13 (10). Spines of the hind tibiæ sulphur-yellow. General coloration more or less green.

14 (15). Pronotum and elytra unicolorous green. Puncturation of the pronotum subobsolete. Hind tibiæ greenish grey from above. Wings distinctly infumate, with the membrane at the base, and the principal veins throughout, rose. (Isl. Lombok.) ..... [*lombokensis*, subsp. n. 2 *d. nigricornis*

15 (14). Pronotum with two indefinite black

lateral fasciæ on its disc; its punctuation coarse (almost as in the typical form). Elytra with dark spots. Wings distinctly infumate, with the base pale rose. (Sarawak, Borneo.) . [*rakensis*, subsp. n. 2*e. nigricornis sara-*

16 (7). Hind tibiæ red or reddish from above.

17 (18). General coloration almost uniformly green. Elytra with the spots scarcely perceptible or obsolete. Hind femora green, without any trace of dark fasciæ. Hind tibiæ from above flesh-red, from below greenish. Wings uniformly infumate, with the base rose. (Sumatra.) ..... [*sumatrensis*, subsp. n. 2*f. nigricornis*

18 (17). General coloration more or less uniformly brown; sometimes the pronotum has a yellow fascia along the middle and is margined behind with the same colour. Hind femora with dark fasciæ. Hind tibiæ blackish red all round, the underside only of a slightly paler shade. (Java.) ..... [*melanocornis* (Serv.). 2*g. nigricornis*

19 (6). Wings strongly infumate (the base, probably, rose). General coloration brown, uniform. Shape and sculpturation of the pronotum as in the typical form. Elytra with indefinite spots and fasciæ. Hind femora not fasciated. (Hind tibiæ of unknown colour.) (Corea.) ..... [*fumosa* (Walk.). 2*h. nigricornis*

20 (5). Wings with the base hyaline or yellowish.

21 (26). Hind tibiæ red.

22 (23). Unicolorous brownish green, with only semilunar spots on the hind knees black. Spines of the hind tibiæ yellow. Pronotum coarsely sculptured; prozona convex; median keel broadly tectiform, fairly sharp, transverse sulci narrow and not deep. (Philippines.) ..... 3. *geniculata* (St.).

23 (22). Greenish or yellowish, with black or blackish design. Hind femora distinctly fasciated. Median keel of the pronotum low; sulci broad.

24 (25). General coloration greenish yellow, with bluish-black and brown design. Lateral lobes of the pronotum, pleuræ, and area externomedia of the hind femora with numerous bluish-grey dots. Spines of the hind tibiæ yellow. (Isl. Waigiou, near New Guinea.) .. [*spersa*, subsp. n. 2*i. nigricornis con-*

25 (24). General coloration sulphur-yellow, with black design. Lateral lobes of the pronotum and pleuræ with only a few bluish-black dots, sometimes confluent; area externomedia of the hind femora with bluish-black dots along

the lower carina, but not on the disc. Spines of the hind tibiæ red. (Amboina, Ceram.) ..... [*gohieri* (Le Guill.). 2*j*. *nigricornis*

26 (21). Hind tibiæ not red.

27 (28). Pronotum strongly swollen in the prozona; metazona with a few elongated tubercles. General coloration brown or greenish brown. Elytra unicolorous or with indistinct spots. Wings infumate. Hind femora fasciated from above. Hind tibiæ greenish black (or greenish grey) from above, pale from below; spines yellow. (Christmas Island.) ..... [*parilis* (Kirby). 2*k*. *nigricornis dis-*

28 (27). Pronotum tectiform; its metazona without tubercles.

29 (30). Hind tibiæ bluish grey, with the spines yellow. Median keel of the pronotum low, not sharp; hind angle obtuse, rounded. General coloration greyish ochraceous; elytra with numerous grey spots. Male cerci with the apex broad, hardly separated from the rest and very feebly decurved. (Celebes.) 4. *transiens* (Walk.).

30 (29). Hind tibiæ pale brown, with the spines unicolorous. Median keel of the pronotum more raised, sharp; hind angle about 90°. General coloration brown; elytra with a few indefinite dark spots. Male cerci with the apex more narrow, distinctly decurved. (Isl. Guam.) .. 5. *excavata* (St.).

31 (4). Pronotum with the fore margin incised in the middle (sometimes very feebly).

32 (35). Pronotum constricted in the prozona. Hind femora fasciated from above. Wings hyaline or but feebly infumate.

33 (34). Median keel of the pronotum distinct throughout, linear. Elytra with numerous spots. Hind femora indistinctly fasciated. Hind tibiæ greenish grey from above; spines orange. Wings somewhat infumate. Male cerci as in *V. nigricornis*. (New Guinea.) ..... 6. *papuasica* (Fin.).

34 (33). Median keel obsolete in the prozona. Elytra with a few indistinct small spots or unicolorous (var. *modesta*, Sjöst.). Hind femora fasciated and with the apex black from above. Hind tibiæ violaceous-red. Wings hyaline. Male cerci parallel-sided, slightly widened before the apex, which is broad, triangular, and directed right downwards, so that the upper preapical angle is about 90°, rounded. (N.W. Australia.) ..... 7. *pulchripes* (Sjöst.).

35 (32). Pronotum narrowed anteriorly, but with-

out a constriction. Hind femora not fasciated. Male cerci strongly compressed laterally, gradually narrowed towards the apex, which is only feebly decurved.

36 (37). Larger. Wings strongly infumated. Uniformly green; elytra somewhat brownish with a few small indistinct spots; hind femora greenish yellow, with black semilunar genicular spots; hind tibiæ dirty red, with the spines orange. (N.E. Australia.) ..... 8. *sjöstedti*, sp. n.

37 (36). "Much smaller. Wings hyaline. Uniformly green, brownish, or brown; elytra without any spots, in the apical half hyaline; hind femora of the general colour, with rows of more or less distinct dark dots along the carinæ; hind tibiæ greyish blue with the apex red; the spines orange or red." (New Caledonia.) ..... [sp. n. 9. *rouxi*, Willemse,

38 (1). Prozona of the pronotum equal or subequal to the metazona (in the males sometimes slightly longer).

39 (40). Pronotum very coarsely sculptured, especially in the prozona, which is distinctly constricted. Pronotum and hind femora along their carinæ with round black spots. Male cerci feebly narrowed towards the apex, which is distinctly separated, narrow and short, decurved in a semicircle, with the lower preapical angle obtuse, rounded. (Australia.) ..... [(Walk.). 10. *maculicollis*

40 (39). Pronotum less coarsely sculptured, with the prozona not at all or feebly constricted, without black spots. Hind femora with the carinæ more or less blackened, but not spotted. Male cerci gradually narrowed towards the attenuate and decurved apex, without a lower preapical angle.

41 (42). Much larger. Median keel of the pronotum not very low, distinctly convex in profile in the prozona. Male cerci with the apical part very narrow, round and long, not shorter than one-third of the whole cercus. (Frankland Island, Queensland, New South Wales (?).) ..... [(Walk.). 11. *irregularis*

42 (41). Small and slender. Median keel of the pronotum very low, linear.

43 (44). Face almost vertical. Frontal ridge above the ocellum slightly widened and coarsely punctured. Prozona of the pronotum slightly tectiform; median keel distinct; hind angle with

the apex obtusely rounded. Male cerci broad, with the apical part compressed laterally, fairly broad, and not longer than one-fourth of the whole cercus. Uniformly brownish; carinæ of the hind femora darkened and dotted. (New South Wales.) .. 12. *elegans*, sp. n.

44 (43). Face strongly reclinate. Frontal ridge not widened and smooth. Prozona of the pronotum perfectly rounded; median keel subobliterate; hind angle with the apex briefly triangularly excised. Male cerci narrow, gradually narrowed towards the feebly decurved apex. Uniformly brownish olivaceous, rather shining; hind femora uniformly olivaceous; hind tibiæ pale sanguineous. (Samoa.) ..... 13. *stercoraria* [(Holdh.).

1. *Valanga meleager* (Sjöst.).

**1921. *Acridium meleager*, Sjöstedt, K. Sven. Vet.-Akad. Handl. lxii. no. 3, pp. 258, 263, pl. xv. fig. 17, pl. xvi. fig. 9, pl. xvii. figs. 6, 6 *a*.

I have studied two paratypes of this species from N. Queensland (in Vienna Museum). The male cerci do not quite agree with the figure by Sjöstedt (pl. xvii. fig. 6 *a*), as the apex is more strongly decurved, and the broad basal part is less narrowed posteriorly; this may be due, moreover, either to a slight error in the figure or to the individual variability of the cerci, which is not uncommon in this genus. The species is very well defined and easily recognisable by the relative shortness of the metazona of the pronotum.

As regards var. *modesta*, Sjöst., of this species, it seems to represent a mixture of some mere colour-aberrations of the typical form with, at least, one distinct species, as the male from Cooktown in the Vienna Museum, which has been examined by me, has obviously nothing to do with *meleager* and is being described by me as *V. sjöstedti*, sp. n. (see p. 357).

V. meleager is, so far, known from Queensland only.

2. *Valanga nigricornis* (Burm.).

This species is distributed all over the Indo-Malayan Archipelago, from Singapore and Corea to New Guinea, and splits into numberless geographical races, each peculiar to a certain island, or even to a part of it. The differences between these races are in some cases very striking and,

perhaps, sufficient to justify their specific separation, while other races may be separated by minor characters only, which seem, however, to be quite constant. A key to subspecies known to me is given above, but there is no doubt that further investigations will bring many more undescribed subspecies. As usual, the synonymy is given under the corresponding subspecies.

2 *a*. *Valanga nigricornis nigricornis* (Burm.). (Figs. 1 B, 2 *c*, 3 *e*, 7 *a*, 8 C.)

1838. *A*[*cridium*] *nigricorne*, Burmeister, Handb. Entom. ii. p. 629. no. 6.
1898. *Acridium melanocorne*, var. *lætum*, Bolivar, Ann. Mus. Gen. xxix. p. 99. no. 55.
1907. ‖*Acridium melanocorne*, Finot, Ann. Soc. Ent. Fr. lxxvi. p. 289 (ad partim!).

Burmeister's original description has been based upon specimens from Singapore, and several specimens from that locality agree perfectly well with the diagnosis. Bolivar's var. *lætum* from Pulo-Penang also undoubtedly belongs here, according to the description; the specimens sent to me from the Madrid Museum as co-types of this variety are from Ceram and obviously not co-types of var. *lætum*, being identical with *V. nigricornis gohieri* (see below).

This subspecies is known to me from Singapore; Perak; Penang Hills, 1800–2500 feet (B.M.).

2 *b*. *Valanga nigricornis allorensis*, subsp. n.

Apart from its colour-characters, this new subspecies, peculiar to Allor Island, is remarkable by its size, being the largest known form of the species. In its general habits and, particularly, in the shape and sculpturation of the pronotum it resembles the Javanese subsp. *melanocornis* and the subsp. *fortis* from the Philippines. The dimensions are as follows:—

Length of body, ♂ 53, ♀ 76 mm.; pronotum, ♂ 12·5, ♀ 16·5; elytra, ♂ 53, ♀ 69; hind femur, ♂ 30, ♀ 40.

Described from one male type and five female paratypes from Allor (B.M.).

2 *c*. *Valanga nigricornis fortis* (Walk.).

**1870. *Cyrtacanthacris fortis*, Walker, Cat. iii. p. 567. no. 35 (ad partim!).

Walker's species has been founded on three co-types, one of which ("*c*") is *Chondracris rosea*, without locality;

specimen "*a*" is a female of *Melicodes tenebrosa*, Walk., from the Philippines, and the specimen "*b*," a female from the same locality, is selected by me as the holotype of *fortis*, as it agrees fairly well with Walker's original description, though it is very badly preserved. My diagnosis of the subspecies is based on a series of specimens in the British Museum from Savu, Philippines, which agree with the Walker's type. This subspecies belongs to the same group as *melanocornis* and *allorensis*, as regards the general habitus and the sculpturation of the pronotum. The dimensions of the ♀ ♀ (the ♂ is unknown to me) are as follows :—

Length of body 54–59 mm.; pronotum 11·5–14; elytra 50–61; hind femur 29–37.

It is almost certain that different islands of the Philippine Archipelago are populated by distinct subspecies of *V. nigricornis*.

2 *d*. *Valanga nigricornis lombokensis*, subsp. n.

1907. ‖*Acridium melanocorne*, Finot (*nec* Serv.!), *l. c.* p. 289 (ad partim!).

Very close to the subsp. *melanocornis*, but separable from it at once by the colour of the hind tibiæ, as well as by the general coloration and by the less coarsely sculptured pronotum. The dimensions of the type are as follows :—

Length of body 47·5 mm.; pronotum 11; elytra 46; hind femur 28.

Described by a single male from Sapit, Lombok, 2000 feet (P.M.; named by Finot as *A. melanocorne*, Serv.).

2 *e*. *Valanga nigricornis saravakensis*, subsp. n.

**1907. ‖*Acridium gramineum*, Finot (nec Stâl), *l. c.* p. 282.

The sole type of Finot's species, incorrectly described under Stâl's name, is before me, and it has nothing to do with the true *A. gramineum*, St., which is a species of *Melicodes*, according to the type also studied by me.

This subspecies is nearer in the shape of the pronotum, its coloration and sculpturation, to the *nigricornis* group, than to that of *melanocornis*, though the median keel is sharper than in *nigricornis*.

The type (a male) is from Nanga-Badau, Borneo (P.M.; named by Finot as *A. gramineum*, St.), and has the following dimensions :—

Length of body 45 mm.; pronotum 10; elytra 42; hind femur 24.

A series of very badly preserved specimens from Sandakan, N. Borneo (B.M.), seems to belong to a distinct subspecies, still more alike to *nigricornis* in the structural characters.

2 *f. Valanga nigricornis sumatrensis*, subsp. n.

Closely resembling in morphological characters *melanocornis*, but of very distinct type of coloration, as shown in the key.

Described from two specimens of different sexes in Madrid Museum, from Padang Pandjang, West Sumatra, the dimensions of which are :—

Length of body, ♂ 49, ♀ 62 mm.; pronotum, ♂ 10·5, ♀ 13; elytra, ♂ 44, ♀ 56; hind femur, ♂ 26, ♀ 33.

2 *g. Valanga nigricornis melanocornis* (Serv.).

1839. *Acridium melanocorne*, Serville, Ins. Orth. p. 659. no. 18.
1839. *Acridium consanguineum*, Serville, *l. c.* p. 660. no. 19.
1907. *Acridium melanocorne*, Finot, *l. c.* p. 289 (ad partim!).
1915. *Acridium melanocorne* (?), Roepke, Teysmannia, xxvi. p. 341, pls. i., ii.

The differences between the Malaccan subsp. *nigricornis* and the Javanese subsp. *melanocornis* are very striking, both in the coloration and in the morphology—in fact, I am inclined to regard them as representatives of two distinct groups or lines of variation. Of course, it is not impossible that more than one subspecies occurs in Java, but all series of specimens seen by me so far are very uniform, and all belong to *melanocornis*. As regards *consanguineum* it is only an individual aberration. The best description of subspecies *melanocornis* and its individual variations is that of Roepke (*l. c.*).

2 *h. Valanga nigricornis fumosa* (Walk.).

**1870. *Acridium fumosum*, Walker, Cat. iii. p. 589. no. 41.

As the type is the only specimen known and is in very poor condition, the exact colour-characters of this subspecies—the coloration of the base of wings and of the hind tibiæ, in particular—remain uncertain ; the wings are, however, much more infumated than in any known subspecies, and this, together with zoogeographical considerations, induces me to keep it separate as a subspecies. In morphological characters it is very like *nigricornis*.

2 *i*. *Valanga nigricornis conspersa*, subsp. n.

This subspecies is closely related to *gohieri* from Amboina and Ceram, as it has a very low median keel of the pronotum ; the sculpturation of the latter is much the same as in *nigricornis*. The general coloration is very peculiar ; the dimensions are as follows :—

Length of body, ♂ (type) 41, ♀ (paratype) 57 mm.; pronotum, ♂ 10, ♀ 13 ; elytra, ♂ 39, ♀ 52 ; hind femur, ♂ 24, ♀ 30·5.

Described from a couple from the Island of Waigiou, off the N.W. extremity of New Guinea (Madrid Museum).

2 *j*. *Valanga nigricornis gohieri* (Le Guill.).

1841. *Acrydium gohieri*, Le Guillon, Revue Zool. p. 295. no. 20.
1853. *Acridium carenicolle*, Blanchard, Voyage au Pôle Sud, Zool. iv. p. 373, Orth. pl. ii. fig. 7.
**1870. *Cyrtacanthacris nigrovaria*, Walker, Cat. iii. p. 566. no. 34.

This subspecies closely resembles subsp. *nigricornis* in its general coloration and in the sculpturation of the pronotum, but differs from it in the base of wings not being rose, in the more depressed median keel of the pronotum, and in the bright red hind tibiæ, which are blackish red in *nigricornis*. I do not think it advisible to separate the form from Amboina and that of Ceram, although a male from Amboina (O.M.) differs somewhat from a series of Ceram specimens in its larger size and more uniformly dark-coloured elytra ; in the case these characters will be proved constant on larger series, the name *gohieri* should be restricted to the Amboina subspecies, and that of Ceram should be called *carenicolle*, Blanch. A male in the Oxford Museum from the Saparua Island, near Ceram, also belongs here.

2 *k*. *Valanga nigricornis disparilis* (Kirby).

**1888. *Cyrtacanthacris disparilis*, Kirby, Proc. Zool. Soc. London, p. 549.
1900. *Cyrtacanthacris disparilis*, Kirby, Mon. Christmas Isld., p. 151. no. 22.

This is a very aberrant form of the species, and may, possibly, claim specific separation, but I prefer to regard it as a subspecies, because there is no difference whatever in the male genitalia.

3. *Valanga geniculata* (Stål).

**1877. *A[cridium] geniculatum*, Stål, Öfv. Vet.-Akad. Förh. no. 10, p. 53. no. 1.

This insect is very likely to be only a subspecies of *V. nigricornis*, but I prefer to regard it as specifically distinct until the male is known.

Stål has not mentioned the exact locality in the Philippines whence the type came, and the type-specimen itself bears as many as three different locality-labels: "Sierra Ballonos, 14–29 Jan. 65"; "Guindulman, Ende Dec. 64"; "Ubay, 6/6.64."

4. *Valanga transiens* (Walk.).

**1870. *Acridium transiens*, Walk. Cat. iii. p. 592. no. 53.
**1907. *Acridium celebense*, Finot, *l. c.* p. 274.

It is on account of the peculiar shape of the male cerci that I regard this insect as not conspecific with *V. nigricornis*.

Finot's detailed description makes it unnecessary to give any notes on the species; it must be, however, mentioned that the male cerci are not "à apex courbé, acuminé," but with the apex comparatively broad-triangular, though acuminate, and scarcely decurved, as the study of Finot's type shows.

Besides the male type of Finot and the female type of the Walkerian species, I have seen one female of this species from Menado, Celebes (M.M.).

5. *Valanga excavata* (St.).

**1860. *Acridium excavatum*, Stål, Freg. Eugen. Resa, Orth. p. 326. no. 69.
1921. *Acridium excavatum*, Sjöstedt, K. Sven. Vet.-Akad. Handl. lxii. no. 3, pl. xvii. fig. 6*b*.

The male cerci of this species are comparatively more narrowed posteriorly than in *V. nigricornis*, and the apex itself is less decurved.

The type is from the island of Guam, and the only specimen known.

6. *Valanga papuasica* (Fin.).

**1907. *Acridium papuasicum*, Finot, *l. c.* p. 293.

Sjöstedt, in his book on the Australian Acrididæ (*l. c.* p. 260), included this New Guinea species among the synonyms of the Australian *V. irregularis*, Walk., under

which latter name he confused more than one species (see below). My conception of *V. papuasica* is based on the actual types of Finot, and it does not even come into the same group with *irregularis* with regard to the relative length of parts of the pronotum.

Besides the types of Finot, I have studied three females from the Stephansort, Astrolabe Bay, Dutch New Guinea (O.M.).

7. *Valanga pulchripes* (Sjöst.).

1921. *Acridium pulchripes*, Sjöstedt, K. Sven. Vet.-Akad. Handl. lxii. no. 3, pp. 258, 264, pl. xvii. figs. 9, 9*a*.

The species is very like *V. meleager* in the shape of the male cerci, but quite distinct from it in the pronotal and other characters given in the key. The only specimen known is the type from Pt. Darwin, N. Territory, Australia.

8. *Valanga sjöstedti*, sp. n.

1921. ‖[*Acridium meleager*], var. *modesta*, Sjöstedt, K. Sven. Vet.-Akad. Handl. lxii. no. 3, p. 264 (ad partim!).

From Sjöstedt's description and figures of var. *modesta*, it appears that he founded it on a somewhat mixed series of female specimens that can hardly all belong to the same species; I find it, therefore, impossible, without examination of the actual type, to refer this variety to any definite species, and therefore omit it from the key.

The only male specimen described by Sjöstedt from Cooktown (Vienna Museum) is before me now; it is clearly not conspecific with *meleager*, differing from it strongly in the shape of the pronotum, and still more in the male cerci, which are of the same type as in *V. papuasica* or *maculicollis*, and not as in *meleager*. There is no doubt that it is a distinct and undescribed species which I have pleasure in dedicating to Professor Y. Sjöstedt.

The dimensions of the type of *V. sjöstedti* are given by Sjöstedt (p. 264) as those of the male of var. *modesta*.

9. *Valanga rouxi*, Willemse, sp. n.

This is a somewhat aberrant species, very easily recognisable by its diminutive size and several morphological characters given in the key; it is obviously peculiar to New Caledonia. A complete description is being published by Dr. C. Willemse in 'Nova Caledonia,' and the diagnosis given in the key has been drawn up by that author at my

special request, in order not to leave the species out of the revision. The dimensions are given by Dr. Willemse, as follows :—

Length of body, ♂ 33, ♀ 43 mm.; pronotum, ♂ 8, ♀ 11; elytra, ♂ 29, ♀ 37; hind femur, ♂ 20, ♀ 23·5.

10. *Valanga maculicollis* (Walk.).

**1870. *Acridium maculicollis*, Walker, Cat. iii. p. 594. no. 60.
1903. *Acridium maculicollis*, Froggatt, Agric. Gaz. N.S. Wales, xiv. p. 1106.
1921. *Acridium maculicollis*, Sjöstedt, K. Sven. Vet.-Akad. Handl. lxii. no. 3, pp. 257, 258, pl. xv. figs. 11, 12.

This magnificent species reminds one strongly of the African *Anacridium mœstum* or the Indian *A. flavescens*, both in the general habitus and in the type of coloration, though, of course, easily separable by the generic characters (see key to the genera).

Var. *vittata*, Sjöst. (*l. c.* p. 259), is, probably, a mere colour-form, which occurs also in other species of the genus (*irregularis*, *nigricornis*, etc.).

The species seems to be widely distributed throughout Northern and Eastern Australia, as it is known from many localities (Sjöstedt, *l. c.*) in N.W. Australia, Queensland, and N.S. Wales.

11. *Valanga irregularis* (Walk.).

**1870. *Cyrtacanthacris irregularis*, Walker, Cat. iii. p. 569. no. 39.
*1921. *Acridium irregulare*, Sjöstedt, K. Sven. Vet.-Akad. Handl. lxii. no. 3, pp. 257, 260 (ad partim!), pl. xv. figs. 13, 14, pl. xvi. fig. 6.

Sjöstedt's idea of this species is too broad and vague, as he included in it at least three distinct species: the true *V. irregularis*, the New Guinea *V. papuasica* which strongly differs from it in the pronotum and in the male cerci, and *V. elegans* (see below).

The figures by Sjöstedt quoted above apply to a more or less typical specimen; the fig. 6 of pl. xvi is most like the type, which differs from it in the somewhat shorter elytra and more rounded pronotum.

The species is as widely distributed as *V. maculicollis* and probably has several geographical races, but the material at hand is insufficient for a study of the latter. Walker's type came from the Falkland Island, off Cape York.

12. *Valanga elegans*, sp. n.

1921. [*Acridium irregulare*], var. *signata*, Sjöstedt, K. Sven. Vet.-Akad. Handl. lxii. no. 3, p. 261 (ad partim!).

It is obvious from Sjöstedt's description and figures of his var. *signata* of *V. irregularis* that it was described from a very mixed series, comprising similarly coloured forms of more than one species. I think it hardly possible, therefore, to define *signata* more precisely and am compelled to leave it out of consideration. At the same time, two of the co-typic male specimens of *signata* in the British Museum are clearly not conspecific with *irregularis*, and differ also from Sjöstedt's figures of *signata* in the size and shape of the pronotum, etc. The principal characters of the new species are given in the key (p. 351), and its dimensions are as follows :—

Length of body 40 mm.; pronotum 8 ; elytra 40 ; hind femur 21·5.

The type and paratype, both males, are from the Tweed River, N.S. Wales.

13. *Valanga stercoraria* (Holdh.).

**1908. *Acridium stercorarium*, Holdhaus, Denkschr. Mat.-Nat. Klasse, K. Akad. Wiss. Wien, lxxxiv. pp. 546, 557.

A very distinct species, remarkable for the strongly oblique (in profile) face, subobliterate median keel of the pronotum, and excised hind angle of the latter; these characters may even be regarded as of generic value, and not as merely specific ones, but I abstain from describing a new genus because the whole Indo-Malayan group of genera is not sufficiently known.

Described from Upolu, Samoa Isles (W.M.) ; there is one female in the British Museum also from Samoa, and another labelled "Billitong," but I doubt the correctness of the latter label.

XV. Genus Gowdeya, nov.

Frontal ridge in profile almost vertical, scarcely convex ; its margins parallel, slightly approximated at the fastigium, subobliterate near the clypeus ; its surface shallowly sulcate below the ocellum in the female, and almost throughout in the male. Fastigium indistinctly sloping, scarcely impressed, with the margins very obtuse. Eyes about twice as high as long ; the subocular distance is less than their

height, but exceeds their length ; the distance between the eyes in the female is equal to the length of an eye and distinctly broader than the frontal ridge ; in the male it is somewhat broader than the ridge, but much narrower than the length of an eye. Pronotum rounded, feebly compressed laterally and somewhat narrowed, but not constricted, in the prozona ; median keel very low and subobliterate by the rugulose sculpturation ; transverse sulci deep and broad. Prosternal spine straight (though its fore margin is somewhat convex in profile), cylindrical, slightly incrassate before the obtuse conical apex. Elytra fairly long and broad, with the apex obliquely rotundato-truncate. Wings coloured, not transparent, except in the apical part. Male cerci simple, almost straight, compressed, narrowed towards the apex ; the subgenital plate elongate, conical, but with the apex not quite sharp. Valvæ of the ovipositor long, slender, not dentate.

This new genus shows some relationship to *Finotina* on the one hand, and to *Melicodes* on the other, but its differences from both are obvious from the key.

1. *Gowdeya picta,* sp. n.

♀. General coloration green and olivaceous-green, with the following parts red : antennæ, head from above, all tarsi, apices of all femora, bases and apices of all tibiæ. Antennæ much longer than the head and pronotum together. Face callosely rugose ; frontal ridge coarsely punctured. Elytra extending considerably beyond the hind knees, green, except the pale anal field. Wings transparent and green in their apical fourth and partly along the preradial area, in the rest not transparent, ponceau-red.

In the male paratype the antennæ are almost twice as long as the head and pronotum together.

Length of body, ♀ 56, ♂ 40 mm. ; pronotum, ♀ 12, ♂ 9 ; elytra, ♀ 51, ♂ 38 ; hind femur, ♀ 27, ♂ 21.

Described from 2 ♀ ♀ from Entebbe, Uganda, 26–29th June, and November (*holotype*), 1912 ; 3 ♀ ♀ from Tero Forest, Uganda, July 1912 (all taken by C. C. Gowdey) ; 2 ♂ ♂ from Bukoba, Tanganyika Territory, September 1921 (*D. Miller*).

XVI. Melicodes, nov.

Frontal ridge in profile straight, slightly reclinate or even vertical, forming a rounded angle with the fastigium. Face

coarsely rugulose. Fastigium of the vertex short, strongly sloping, thick, longitudinally impressed, with margins very obtuse, punctured. Distance between the eyes distinctly less than the horizontal diameter of an eye, but slightly more than the width of the frontal ridge between antennæ; the height of an eye about half as much again as that of the subocular sulcus. Pronotum slightly compressed laterally, almost cylindrical, with a coarse, honeycombed sculpturation; the prozona perfectly rounded; metazona somewhat flattened; median keel completely obliterate, or scarcely perceptible but discontinuous, interrupted by the sculpturation. Prosternal tubercle thick, straight, cylindrical with the apex obtusely conical. Elytra perfectly transparent in the apical half and semi-transparent in the basal half, where the veinlets are incrassate, but not confluent. Wings hyaline, or slightly infumate. Hind femora stout, gradually narrowed towards the apex, with the middle and outer upper keels serrate. Hind tibiæ with 8–9 outer and 10–11 inner spines.

This genus is easily recognisable by the peculiar sculpturation and obliterate median keel of the pronotum. It seems to be restricted to the Philippine Islands whence three species are known at present, though the material at hand is very scanty, and it is not impossible that more species will be found, while, on the other hand, a study of extensive series of specimens may render it necessary to unite two of the now recognised species.

Key to the Species.

1 (2). Pronotum somewhat constricted in the prozona, with a very coarse sculpturation; the raised margins of the alveolæ forming irregular longitudinal ridges. Hind tibiæ red. Wings faintly infumate towards the apex ..... 1. *vittaticollis* (Stål).

2 (1). Pronotum not at all or scarcely constricted in the prozona, with the sculpture less coarse and without longitudinal ridges. Hind tibiæ not red.

3 (4). Prozona of the pronotum somewhat tectiform, in profile slightly convex; its sculpturation coarser. Wings distinctly infumate ..... 2. *tenebrosa* (Walk.).

4 (3). Prozona perfectly rounded, in profile straight; its sculpturation less coarse. Wings scarcely infumate ..... 3. *graminea* (Stål).

1. *Melicodes vittaticollis* (Stål).

**1877. *A[cridium] vittaticolle*, Stål, Öfv. Vetensk.-Akad. Förh. xxxiv. no. 10, p. 53. no. 2.

I have not mentioned in the key the two olivaceous fasciæ on the pronotum, as they probably may disappear altogether or be present in other species as well.

Geographical distribution. Philippine Islands; Sibon and Riv. Agusan, 2 ♂ ♂, 1 ♀ (S.M.; Stål's types).

2. *Melicodes tenebrosa* (Walk.).

**1870. *Acridium tenebrosum*, Walker, Cat. iii. p. 590. no. 50.
**1870. *Cyrtacanthacris fortis*, Walker, Cat. iii. p. 567. no. 35 (ad partim!).
**1877. *A[cridium] cognatum*, Stål, Öfv. Vetensk.-Akad. Förh. xxxiv. no. 10, p. 53. no. 3.

Walker's type of *tenebrosum*, which is a male and not a female as Walker says in his description, agrees perfectly well with Stål's female type of *cognatum*. For the synonymy of *Cyrt. fortis*, see a future instalment of this paper.

Geographical distribution. Philippine Islands, 1 ♂, 1 ♀ (B.M.; Walker's type of *tenebrosum* and paratype of *fortis*); Centro del Abra, 1 ♀ (S.M.; Stal's type of *cognatum*); Manila, 1 ♀ (S.M.).

3. *Melicodes graminea* (Stål).

**1877. *A[cridium] gramineum*, Stål, Öfv. Vetensk.-Akad. Förh. xxxiv. no. 10, p. 53. no. 4 (nec Finot, 1907!).

The difference between this species and *M. tenebrosa* is very slight, but I cannot decide whether they are really different specifically or conspecific, as the material studied is too insufficient.

Geographical distribution. Philippine Islands: Dalupipi, 1 ♀ (S.M.; Stål's type); 1 ♀ (B.M.); Luzon, 1 ♀ (B.M.).

XVII. Genus Patanga, nov.

Face vertical or slightly reclinate. Frontal ridge more or less parallel-sided, sometimes slightly constricted at the fastigium, somewhat impressed below the ocellum; its margins reaching the clypeus. Eyes not twice as high as long; subocular distance exceeds their length, but is shorter than their height; the distance between the eyes is broader than the frontal ridge, but distinctly narrower than the subocular distance. Pronotum distinctly compressed laterally and constricted in the prozona, rounded, with the

median keel very low and almost subobliterate owing to the coarse honeycombed sculpturation. Prosternal spine more or less compressed laterally, inclined, but not bent, towards the mesosternum, not nearly reaching the latter. Mesosternal lobes with the inner margins more or less concave, so that their interspace is somewhat cordiform (fig. 1 C). Elytra extending well beyond the hind knees, scarcely narrowed towards the apex, which is obliquely rotundato-truncate; reticulation of the discoidal field in its basal part and all along the middle incrassate and confluent, so that those parts appear hardly transparent, while the rest of the field is remotely reticulate and transparent. Wings tinged with rose or hyaline. Hind femora long, slender, with the apical part attenuate (fig. 7 *b*). Male cerci laterally compressed, long, with the apex attenuate, decurved and incurved. Male subgenital plate long, conical, pointed.

This genus, based on *Gryllus Locusta succinctus*, L., as the genotype, consists of three not very uniform species, of which *P. luteicornis* deserves, perhaps, to be separated into a genus of its own, intermediate in some respects between *Patanga* and *Melicodes*, but it shows more affinities with the former and I prefer to keep it in *Patanga*. *P. japonica* also shows some characters not quite agreeing with those of *succincta*, and exhibiting a relationship with the *Valanga* group of genera (shorter hind femora and elytra, more vertical face, etc.), but it is undoubtedly very closely related to *succincta*.

Key to the Species.

1 (2). General coloration almost uniformly green. Face very coarsely sculptured; frontal ridge at the fastigium constricted. Hind tibiæ red. Male cerci not strongly compressed, much longer than the supra-anal plate, S-shaped, gradually narrowed apically. (Malaya.) ..... 1. *luteicornis* (Serv.).

2 (1). General coloration pale with grey, brown, or black pattern, or more or less uniformly greyish or brownish, but never green or even greenish. Prosternal tubercle scarcely or not at all compressed laterally. Male cerci strongly compressed laterally.

3 (4). Face coarsely punctured. Prosternal tubercle very thick and obtuse. Prosternum very hairy. Wings rose basally and distinctly infumate apically. Smaller, but heavier-built, insect with

comparatively shorter elytra and hind femora. (Japan, China, N.E. India (Oceania?).) ..... 2. *japonica* (Bol.).

4 (3). Face sparsely and finely punctured. Prosternal tubercle slender, with the apex conical. Prosternum with but sparse hairs. Wings rose basally (not always) and hyaline with dark veins in the rest. Larger and more slender insect, with longer elytra and hind femora. (S. Asia, Malaya, Oceania.) ..... 3. *succincta* (L.).

1. *Patanga luteicornis* (Serv.).

1839. *Acridium luteicorne*, Serville, Ins. Orth. p. 658. no. 17.
**1907. *Acridium luteicorne*, Finot, *l. c.* p. 287.

This well-known species reminds one somewhat of a representative of the genus *Melicoides*, forming a kind of link between that genus and *Patanga* but undoubtedly belonging to the latter, as the shape of the mesosternal interspace and other generic characters show most clearly.

Geographical distribution. Malacca: Singapore (B.M.; P.M.), Penang (B.M.; P.M.); Sumatra: Mt. Singalang, Painan (O.M.); Nias Isld.: Kalim Bungo (O.M.); Borneo: Sandakan, Sarawak (B.M.), Kushing (O.M.). (A specimen in O.M. bears label: "Salisbury, Mashonaland," but it is obviously an error.)

2. *Patanga japonica* (Bol.). (Fig. 3 *c*.)

*1898. *Acridium japonicum*, Bolivar, Ann. Mus. Civ. Genova, xxxix. p. 98. no. 54.
*1907. *Acridium japonicum*, Finot, *l. c.* p. 286.

The peculiar shape of the prosternal tubercle, strong pilosity of the whole underside, and especially of the prosternum, as well as the coarse puncturation of the face furnish excellent characters for this species. It is also somewhat aberrant in the shape of the pronotum, which is less distinctly selliform and has a more pronounced median keel than other species of the genus. I regard, however, all these characters as specific only and not justifying the generic separation of *japonica*.

The species described as *Acridium japonicum* by Shiraki (Acrid. Japans, 1910, p. 67. no. 3) hardly belongs here, as it is said to have colourless wings, conical prosternal tubercle, and short triangular male cerci; it is not possible even to tell whether it belongs to the genus *Patanga* at all, which compels me to leave it out of further consideration.

Specimens of this species from Eastern India differ from

the typical Japanese and Chinese form in being more slender, with comparatively longer elytra and a more distinctly selliform pronotum; they may probably be separated as a distinct subspecies, but I refrain from doing this at the present time, as the material at hand is very scanty and badly preserved.

A single specimen from Rarotonga (B.M.), which undoubtedly belongs to this species, is also somewhat different from the typical form, being more robust, with the pronotum hardly selliform at all and the wings distinctly infumate; but, again, I do not think it advisable to found a subspecies on a single specimen.

Geographical distribution. The species was originally described from Yokohama. I have studied the specimens from the following localities (omitting mere "Japan"):—Kobe, Japan (B.M.); Kioto (W.M.); Yokohama (W.M.); Tsushima (B.M.); Kiaou-Tschaou (Prof. Ebner coll.); Kieng-Tchang, basin du Ya-Long, Mienning, 1200 m. (P.M.); Kouy-Tchéou, Gan-Chouen, Nin y Fou et Loyang (P.M.); Ai San, 30 miles W. from Che-Foo (B.M.); Hai-Ring (B.M.); Haute Plateau Yunnanais, district de Yunnan-Fou, 1850–2000 m. (P.M.); Himalaya (G.M.); Indes Orientales (B.M.: M.M.); Gantok, Sikkim (B.M.); Bajaura, Kangra district (P.M.).

The last-named locality is the most eastern one that is accurately known; there is in the British Museum a specimen labelled "N.W. India," but Mr. C. Horne's collection, to which it belongs, includes some other insects that are also of an unquestionably Eastern Himalayan origin.

3. *Patanga succincta* (L.). (Figs. 1 C, 2 *d*, 3 *d*, 7 *b*, 8 A, 8 B.)

*1763. *Gryllus Locusta succinctus*, Linnæus, Amœn. Acad. vi. p. 398. no. 36.
1846. *Acridium assectator*, Fischer Waldheim, Entom. Imp. Ross. iv., Orth. Imp. Ross. p. 235. no. 2, pl. xii. † fig. 2.
**1870. *Cyrtacanthacris fusilinea*, Walker, Cat. iii. p. 564. no. 30.
**1870. *Cyrtacanthacris inficita*, Walker, *l. c.* p. 565. no. 32.
**1870. *Acridium rubescens*, Walker, *l. c.* p. 588. no. 39.
**1870. *Acridium elongatum*, Walker, *l. c.* iv. p. 636.
**1907. *Acridium succinctum*, Finot, *l. c.* pp. 311, 322, 349.
**1914. *Orthacanthacris succincta*, Kirby, Fauna Brit. India, Acrid. p. 227. no. 273, fig. 125 (the figure is erroneously called *O. flavescens*!).
**1914. *Cyrtacanthacris succinctus*, var. *sternocardias*, I. Bolivar, Journ. Straits Branch R. Asiat. Soc. no. 67, p. 88.

The figure and description of *Acridium assectator*, F. W.,

† vii., instead of xii. in the text of the original work.

leave no doubt that it is the species identical with *succincta*, and their proximity has been mentioned by Fischer himself (*l. c.* p. 236); Kirby missed Fischer's species in his catalogue altogether.

The species is readily recognisable by the somewhat abnormal (for the genus) shape of the prosternal tubercle and by the (normally) rose base of the wings. The shape of the tubercle is to a certain extent variable, as in some specimens it is practically straight and perpendicular, while in others it is distinctly inclined and even bent backwards, but its apex always fails to reach the mesonotum by a long way.

The shape of the mesosternal interspace is also not very constant, and its sides (*i. e.*, inner margins of the mesosternal lobes) may be more or less convex, which results in the interspace being either feebly narrowed behind or almost cordiform; I believe it to be a purely individual character, and regard, accordingly, the var. *sternocardias*, Bol., based on a specimen with cordiform interspace, as a pure synonym of *succincta*. In describing the variety Bolivar also mentioned its smaller size and more uniform coloration, but these are also only individual variations; the general coloration in this species, as in other swarming locusts, is even liable to changes during the individual life.

Geographical distribution. The species is distributed all over Southern and South-Eastern Asia and Malayan Archipelago, but its exact range is as yet very incompletely known. According to Bainbrigge Fletcher (Proc. Third Entom. Meeting at Pusa, i. p. 310), it "occurs throughout the plains of India and Ceylon," but a more exact definition of the area of its distribution is not given, and the most interesting point about the north-western limit still wants investigation. In the East the species ranges into China, but the only exact record is Tonkin (B.M.). As for its distribution over islands†, it is known to me from the following localities:—Kalim-Bung, Nias Isl. (O.M.); Sumatra (B.M.); Borneo, Batu-Lawi Expedition (M.M.; Bolivar's type of *sternocardias*). Brunner v. Wattenwyl records it (Abh. Senckenb. Nat. Ges. xxiv. 1898, pp. 194–199) also from Batjan, Halmahera, and Ternate. Sjöstedt's record from Australia (Kungl. Sv. Akad. Handl. lxii. no. 3. p. 270, 1921) is based on a single old specimen in Brunner v. Wattenwyl's collection and wants to be corroborated. I. Bolivar recorded this species also from

† I do not give a list of localities in India, as it does not give a definite idea of the area.

Luluaborg, Congo (Mem. Soc. Ent. Belg. xvi. 1908, p. 112. no. 114), but, though not doubting his identification, I am sure that he has been misled by an erroneous label. Fischer Waldheim, who records the species as *Acridium assectator* (*l. c.*), from the Kirghiz Steppes, is doubtful whether the locality is correct, and it may be positively stated that its occurrence there, even in stray specimens, is out of the question.

[To be continued.]

XLI.—*Report on the Echinoderms collected during the Voyage of the 'Quest'* (1921–22). By GEORGE A. SMITH, British Museum (Natural History).

THE collection of Echinoderms brought home by the 'Quest' consists of 106 specimens, representing 18 species. They were all dredged in two hauls, Nos. 109 and 110, on May 22nd, 1922, one mile off Larsen Point, South Georgia, in 50 fathoms, the temperature of the sea being 34° and that of the atmosphere 28° Fahr.

They form a valuable addition to the National Collection, which is enriched by three new species and seven not previously represented. Moreover, they help to throw light on the distribution of the Echinasteridæ.

Prof. Koehler, to whom I submitted four species which appeared to be new, very kindly examined them for me, and, from material then before him, was able to identify one as *Ophioceres incipiens* ; the other three I have here described as new.

Opportunity is taken to refer to the description and illustration of certain young forms by Bell in his Antarctic ('Discovery') Report on the Echinoderma, and to questions raised by Koehler in his Report upon the collection made by the 'Nimrod' in the Antarctic.

I acknowledge with great pleasure my indebtedness to Prof. Koehler for his very kind assistance.

The following is a complete list of the Echinoderms obtained by the 'Quest' :—

ASTEROIDEA.

Podasterias meridionalis (Perrier).
Hemiasterias biseriata (Koehler).
Echinaster spinulifer, E. A. Smith.
Porania antarctica, E. A. Smith.
Leptoptychaster, sp.

Ophiuroidea.

Ophiacantha vivipara, Ljungman.
Ophiodiplax disjuncta, Koehler.
Amphiura mortenseni (Koehler).
Ophioceres incipiens, Koehler.
Ophionotus hexactis (E. A. Smith).
Amphiophiura rowetti, sp. n.
Ophiomastus rotundus, sp. n.
Ophiurolepis resistens (Koehler).
Ophiolebes biscutifer, sp. n.

Echinoidea.

Ctenocidaris speciosa, Mortensen.
Sterechinus agassizi, Mortensen.
Abatus shackletoni, Koehler.

Holothurioidea.

Cucumaria georgiana, Lampert.
Psolus koehleri, Vaney.
Psolus sp.

Asteroidea.

Echinaster spinulifer, E. A. Smith.

Othilia spinulifera, Smith, Ann. & Mag. Nat. Hist. (4) xvii. 1876, p. 107.
Echinaster spinulifer, Smith, Phil. Trans. clxviii. 1879, p. 274, "Zoology Kerguelen Island."

Four specimens, light brown in alcohol. The principal measurements are:—

R. 9 mm., *r.* 3 mm., R.=3*r*.
R. 11 mm., *r.* 4 mm., R.=2·7*r*.
R. 9 mm., *r.* 4 mm., R.=2·2*r*.
R. 11 mm., *r.* 4 mm., R.=2·7*r*.

This species has, so far, only been found at Kerguelen; its discovery by the 'Quest' at South Georgia is of considerable interest.

Ophiuroidea.

Ophiacantha vivipara, Ljungman.

Ophiacantha vivipara, Ljungman, Öfv. Kong. Vet.-Akad. Förh. xxvii. 1870, p. 471.

There are sixteen specimens of this well-known species, in eight of which the young may be seen escaping through the genital openings. The measurements of the largest specimen

with protruding young are:—Length of an arm 65 mm., diameter of disc 11 mm.; the smallest has an arm-length of 35 mm. and a disc diameter of 9 mm.

Ophiodiplax disjuncta, Koehler.

Ophiodiplax disjuncta, Koehler, Astéries, Ophiures et Echinides, Brit. Antarc. Exped. ('Nimrod'), 1907–9, Biology, ii. pt. iv. 1911, p. 48, pls. vi. & vii.

When Koehler instituted this genus he gave as the chief diagnostic character a transverse ridge on the dorsal arm-plates. In his report on the Ophiuroidea, Australian Antarc. Exped. (1911–14), Sci. Rep. ser. C, Zool. & Bot. viii. pt. 2, 1922, p. 16, pl. lxxviii. figs. 4, 5, 9, & 12, he remarks upon the variation of the spines of the disc and arms of some specimens received since the publication of his original description. He does not, however, refer to the transverse ridge, so that he still, presumably, considers the presence of this character diagnostic of the genus.

In the specimens before me this character is neither strong nor persistent. It may only be discerned here and there, and is more prominent when, as occasionally happens, there are small spines set upon it.

I should like to take the opportunity to refer to the description and illustrations given by Bell of certain young Ophiurids in his report on the Echinoderma, Nat. Antarc. Exped. ('Discovery'), Nat. Hist. iv. (1908) p. 14, pl. iv., and which Koehler, Brit. Antarc. Exped. ('Nimrod'), Biology, ii. pt. iv. (1911) p. 50, is inclined to refer to this species.

The measurements of the 'Discovery' specimens are:—

Length of an arm 39 mm,	diameter of disc 8 mm.		
„	„ 43 mm.,	„	„ 7 mm.
„	„ 32 mm.,	„	„ 8 mm.
Arms broken,		„	„ 9 mm.

An examination of Bell's specimens shows that there is a transverse ridge on a few of the dorsal arm-plates, but it is by no means a prominent character. In his figs. 3 and 6 the tentacular spine is, as Koehler suggests, inaccurately drawn. The figures represent each tentacular pore as provided with a pair of transversely elongated scales, whereas the specimens possess but a single tentacular spine. There is also a further error in figure 3, where a small plate is represented between the apices of the side mouth-shields. This plate does not exist. The 'Discovery' specimens are much more slender than those of the 'Quest,' and the plates are considerably

separated, through lack of calcification. This lack of calcification led Bell to suggest that his specimens might be young forms. I think, however, that they represent stages in which a very considerable resorption of the calcified plates has taken place. Consequently, the plates can be seen lying loosely in the integument, but separated from one another; ultimately these plates will fuse together and reform the normal exoskeleton. I agree with Koehler in referring the specimens to *Ophiodiplax disjuncta*.

Ophioceres incipiens, Koehler.

Ophioceres incipiens, Koehler, Aust. Antarc. Exped. (1911–14), Sci. Rep. ser. C, Zool. viii. pt. 2, 1922, p. 48.

Seven specimens, disc slate-coloured, arms white in alcohol. The principal measurements of the largest and smallest specimens are:—Length of an arm 15 mm., width at base of an arm 2 mm., diameter of disc 8 mm.; length of an arm 8 mm., width at base of an arm 1 mm., diameter of disc 4 mm.

These specimens agree with forms found by Koehler in the collection of Ophiuroidea belonging to the Australian Antarctic Expedition, and upon which he founded this genus and species. The present specimens are somewhat smaller than those originally described. I am indebted to Prof. Koehler for kindly identifying the specimens, his report, at the time of working out the 'Quest' collection, not having been received.

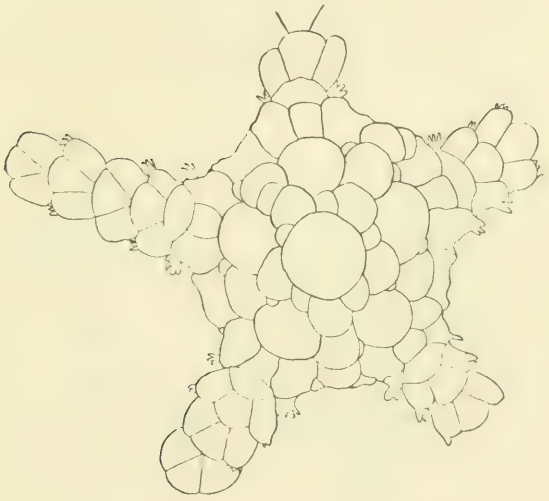
Amphiophiura rowetti, sp. n. (Fig. 1.)

Two specimens, buff-colour in alcohol:—(1) Length of an arm 9 mm., width at base 1 mm., diameter of disc 4 mm.; (2) length of an arm 7 mm., width at base 1 mm., diameter of disc 3 mm.

The outline of the disc is pentagonal, with vertical sides. The dorsal surface is occupied by large circular and semicircular imbricating plates. The centro-dorsal plate is the largest and is completely circular; around it is a rosette of smaller semicircular plates. Five primary plates, situated opposite to the junction of the arms with the disc, alternate with five rather prominent bands of plates which extend from the centro-dorsal to the periphery of the disc in the interradii. The radials are more or less rectangular in outline, convex, each pair separated by a plate slightly smaller, but similar in shape. In each interradius the sides

of the disc are occupied by an ellipse of plates, surrounding a slightly larger central one. Upper arm-plates are prominent and very convex; the first three or four are in contact with one another. The side arm-plates are swollen and meet ventrally from the third plate. The first carries two conical spines, the remainder four; the spines are roughened and almost equal. The mouth-papillæ are thick and square, two or three to each mouth-angle, with a large pointed tooth at the apex. Jaws indistinct, twice as long as wide, meeting within, the proximal ends prominent; the side mouth-shields are about the same size and shape as the jaws. The mouth-plate is very large, oval, pointed proximally, and occupies

Fig. 1.



Amphiophiura rowetti, sp. n.

the whole of the interbrachial area on the ventral surface. Genital slits long and narrow, reaching to the edge of the disc. The genital scale commences just beyond the mouth-shield, and is composed of six to seven granules, square-shaped at first, later becoming conical and much enlarged; they continue up the side of the disc to form the arm-comb, which does not quite reach the radial plates. The first ventral arm-plate forms an equilateral triangle, the second is almost rectangular, while from the third the proximal end is angular and the sides straight; later they become pear-shaped in outline. Only the first three plates are in contact

with one another. The tentacular pores are well developed, those in the oral area are situated some distance from the mouth-slits and are guarded by six prominent tentacular scales—three on each side,—the distal one being the largest. The first pore has three proximal and two distal spines, the second and third three proximal and one distal, after which each pore has three proximal tentacular spines; the outer one is much the largest and is very similar to the topmost arm-spine.

Studer, in his "Die Seesterne Sud-Georgians" (Jahr. wiss. Anst. Hamburg, ii. 1885, p. 16, pl. ii. fig. 8), described and figured *Ophioglypha martensi* from South Georgia. The 'Quest' specimens show several differences, especially in the arrangement of the plates on the dorsal surface of the disc. They appear, however, to be closely allied to *A. spatulifera*, Koehler, collected by the 'Albatross' in the region of the Philippines, but differing in the number of mouth-papillæ and in the number and disposition of the spines upon the side arm-plates.

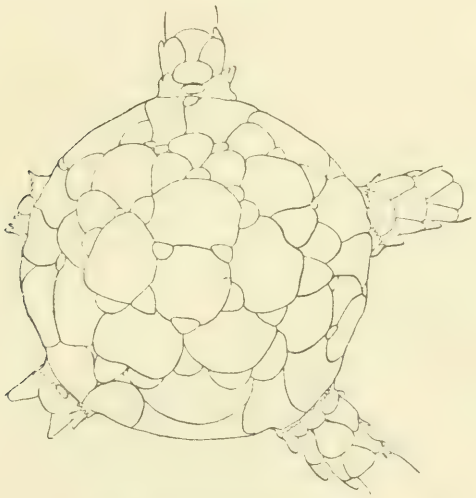
Ophiomastus rotundus, sp. n. (Fig. 2.)

Three specimens, white in alcohol:—(1) Length of an arm 13 mm., width at base of arm 1 mm., diameter of disc 5 mm.; (2) length of an arm 13 mm., width at base of an arm 1 mm., diameter of disc 6 mm.; (3) length of an arm 10 mm., width at base of an arm under 1 mm., diameter of disc 4 mm.

Disc circular, convex dorsally, flat ventrally. Arms five, very slender, tapering to a point. The dorsal surface of the disc is covered by large imbricating oval plates. In the centre is situated a centro-dorsal plate, surrounded by five slightly larger primary plates; four small triangular plates overlap the edges of the centro-dorsal and the surrounding primaries. External to each of the latter is a group of semicircular plates, and a large elongated plate occupies the interradial area at the periphery of the disc. Radials large, varying in shape, but more or less rectangular; proximally they are usually separated by a semicircular plate. Mouth-papillæ square and thick, three or four on each mouth-angle; the innermost one pairs with that of the other side, is larger and more pointed than the rest. Jaws elliptical, meeting within; between the jaws and the apical papillæ a very small oral plate may be present. The side mouth-shields extend to the distal end of the first ventral arm-plate and taper to a point, meeting within. The mouth-shields are very large

and convex distally; their sides are parallel, until at their junction with the side mouth-shields they slope inwards to a point. The remainder of the interbrachial area below is occupied by a large oval plate, around which are grouped a number of smaller semicircular plates. The genital openings are narrow, extend to the periphery of the disc, and are bordered by evenly placed truncated granules, which pass upward to form the arm-comb. This comb extends to the radials; the two series do not, however, quite meet across the base of the arm. First ventral arm-plate oval, obtusely pointed proximally; second similar, but longer than wide; from the third the plates become triangular, with rounded

Fig. 2.



Ophiomastus rotundus, sp. n.

basal angles; the first three plates only are in contact with one another. The side arm-plates are large and swollen; they are in contact, ventrally, from the second plate, and towards the middle of the arm they begin to occupy the greater part of the arm-joint. The first plate bears two spines, the second to seventh three, and the remainder four spines. These spines are roughened, pointed, and peg-shaped; they are of equal size and evenly placed on the edge of each side arm-plate, of which they are about half the length. The oral tentacular pores are guarded by four truncated scales on each side; the outer ones are in line with the

mouth-papillæ, which they much resemble; these pores are very close to the mouth-slits, but they do not appear to open into them. The first pair of tentacular pores have each two spines, the remainder one to each pore. Upper arm-plates convex, proximally straight; from the third they are triangular, about as wide as long, with the distal border convex.

This species is very near to a form which Koehler is describing as new in his Report, 'Astéries et Ophiures recueillies par les Expéd. Antarc. Suédoises de M. Nordenskjöld' (in the press).

Ophiolebes biscutifer, sp. n. (Fig. 3.)

Eleven specimens, buff-colour in alcohol. The principal measurements of typical specimens are:—(1) Length of an arm 16 mm., width at base of an arm 1 mm., diameter of disc 5 mm.; (2) length of an arm 16 mm., width at base of an arm 1½ mm., diameter of disc 7 mm.; (3) length of an arm 6 mm., width at base of an arm 1 mm., diameter of disc 3 mm.; (4) length of an arm 10 mm., width at base of an arm 1 mm., diameter of disc 4 mm.

Disc round to pentagonal, covered with unequal polygonal imbricating plates, of a glistening appearance, microscopically punctate; on the largest specimens a centro-dorsal plate may be present. On the dorsal surface are numerous small bead-like tubercles which may, as in the specimen figured, be irregularly scattered, but often clearly outline each plate; the radial plates are hardly distinguishable. Mouth-papillæ three to four on each mouth-angle, large and square, with a large conical tooth. Jaws not very distinct, two and a half times as long as wide, meeting within, and pointed at both ends. In some specimens there is a small tubercle behind the apical tooth. Side mouth-shields as wide as long, pointed proximally, barely meeting within; they are separated from the shields of the neighbouring angle by a small triangular plate, with its apex pointing distally. Mouth-shields twice as wide as long, pointed proximally, lateral angles rounded, and the distal border convex. The genital openings are exceedingly small, about equal in length to the first side arm-plate. The genital scale consists of several small irregularly arranged granules. In the interbrachial area on the ventral surface the plates and tubercles are similar to those on the dorsal surface of the disc. Upper arm-plates rounded or triangular, with their distal border slightly convex; they are separated by small rectangular supplementary plates. Just beyond the middle of the arm these plates disappear and

the side arm-plates meet dorsally. The ventral arm-plates are widely separated; they begin by being triangular, with rounded basal angles, more distally they become semicircular, and towards the tip of the arm triangular again but smaller; in some of them the distal border has a slight depression. The side arm-plates are well developed, and ventrally are in contact with one another. The first plate bears a single spine, the second two, the next four three, seventh to ninth

Fig. 3.

Ophiolebes biscutifer, sp. n.

four, and from the tenth three short thick spines of equal length and situated close together. Each tentacular pore has a small, flat, very truncated spine.

The specimens referred to this species form a series showing various stages in development. The ornamentation of the disc-plates exhibits considerable variation, even among specimens of the same size. In some all the plates are evenly bordered with regularly formed bead-like tubercles,

in others the tubercles are associated only with plates situated towards the periphery of the disc, whilst in the larger specimens the tubercles are found here and there upon the plates. It is quite possible to trace in the specimens before me the gradual disappearance of these bead-like tubercles from the dorsal surface of the disc. There is, too, a considerable difference in the calcification of the plates ; in some specimens the plates are very heavily calcified, whilst in others new plates appear to be in process of formation, and may be seen lying in the integument separated from one another. Further, there is some variation in the shape of the disc, which may be flat and regularly pentagonal or convex and round; it appears possible that there is a correlation between this variation and the ripening of the ovaries.

Despite the variation in the shape and ornamentation of the disc, I have no hesitation in referring all the specimens to the same species. It is by no means clear, as has been assumed by Bell and some other authors, that specimens with imperfectly calcified plates are necessarily young. The occurrence of comparatively large specimens in this condition suggests rather that partial decalcification may possibly be a recurrent phase in the life-history.

This species resembles *Ophiolebes paucispina*, H. L. Clark, in the arrangement of the plates and tubercles on the dorsal surface of the disc, but differs from it in the shape of the mouth-papillæ and the division of the ventral arm-plate, as figured by H. L. Clark in his "Report on the Ophiurans of the Philippine and Adjacent Waters," Bull. U.S. Nat. Mus. lxxv. 1911, p. 246, fig. 119.

XLII.—*New or little-known* Tipulidæ (*Diptera*).—XVIII. *Australasian Species*.

By Charles P. Alexander, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

The new species described in this paper were collected in the Province of Westland, New Zealand, by Mr. Thomas R. Harris, and in New South Wales by Dr. E. W. Ferguson. I am very greatly indebted to the collectors for the privilege of studying these extensive series of crane-flies. Unless stated to the contrary, the types are preserved in the writer's collection.

Dicranomyia unijuga, sp. n.

Belongs to the *huttoni* group ; thoracic pleura extensively darkened ; femora with a narrow dark brown subterminal ring ; wings yellow, sparsely variegated with dark brown ; abdomen yellow with a subterminal or terminal brown cross-band on the basal tergites.

Male.—Length 6 mm. ; wing 7·2–7·5 mm.

Female.—Length 6·5 mm. ; wing 7·2 mm.

Rostrum from one-third to one-half longer than the head, dark brown, including the palpi. Antennæ with the scape light brown ; flagellum black, the extreme apex of the pedicel of each segment yellow. Head grey.

Mesonotum ochreous, rather shiny. Pleura extensively dark brown, this including the postnotal pleurotergites ; sternopleura pale. Halteres brown, the knobs obscure yellow. Legs with the coxæ and trochanters obscure yellow ; femora yellow, each with a narrow black ring at a little more than its own length before the apex ; tibiæ and basal three segments of tarsi yellow, the terminal tarsal segments blackened. Wings strongly tinged with yellow ; stigma brown, distinct ; a small brown spot at origin of *Rs* ; narrow but distinct brown seams along the cord and outer end of cell 1*st* M_2 ; veins pale, darker in the infuscated areas. Venation : *Sc* short, ending opposite the origin of *Rs*, Sc_2 close to the tip of Sc_1 ; *Rs* gently angulated at origin, about two and one-half times the basal deflection of R_{4+5} ; basal deflection of Cu_1 just before the fork of *M*.

Abdominal tergites yellow, the basal segments with a relatively narrow, transverse cross-band of brown before the still narrower yellow apex, the bases of these segments broadly yellow ; on the subterminal segments the brown colour includes all the segments ; in some specimens the yellow apex is obliterated so the segments appear yellow and dark brown, dimidiate ; hypopygium reddish brown. Male hypopygium with the ninth tergite gently notched, the lobes setiferous. What appears to be the anal tube appears as a conspicuous median lobe that exceeds in length the lateral tergal lobes and is conspicuously setiferous. Basistyles with the mesal lobes globular, setiferous ; ventral dististyle relatively small, the rostrum extensively blackened, near its base with two small subequal spines that are in transverse alignment or nearly so. Ædeagus broad.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 21, 1923 (*T. R. Harris*).

Allotopotype, ♀, February 23, 1923 (*T. R. Harris*).
Paratopotypes, 2 ♂♂, February 21–23, 1923; *paratype*, 1 ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Dicranomyia crassispina, sp. n.

General coloration brownish yellow; median area of scutum and scutellum broadly pale yellow, the remainder dark brown; femora dark brown, each with a narrow yellow subterminal ring; wings with a strong brown tinge; cord narrowly seamed with darker brown; abdominal segments indistinctly bicolorous; outer spine of rostrum of male hypopygium incrassate.

Male.—Length 6·8–7 mm.; wing 8·5–8·6 mm.

Rostrum and palpi black. Antennæ black throughout, the basal flagellar segments oval, the terminal segments becoming more attenuate. Head dark grey.

Pronotum dark brown medially, paler laterally. Mesonotal præscutum obscure yellow, the median area broadly dark brown, widened behind; scutum and scutellum broadly pale yellow medially, the lateral portions dark brown; central portion of postnotal mediotergite dark brown. Pleura obscure brownish yellow, with greenish tints. Halteres dark brown, the base of the stem light yellow. Legs with the coxæ and trochanters greenish testaceous; femora brown, paler basally, passing into dark brown toward the tips; a relatively narrow but conspicuous yellow ring a little less than its own length before the blackened tips; tibiæ and tarsi brownish black. Wings with a strong brown tinge; stigma slightly darker brown; restricted but conspicuous dark brown seams at origin of *Rs*, along cord and outer end of cell 1*st* M_2; veins dark brown. Venation: Sc_1 ending just beyond origin of *Rs*, Sc_2 some distance from its tip, Sc_1 alone equal to or a little shorter than the basal deflection of Cu_1; *Rs* gently arcuate, about one-half longer than the basal deflection of R_{4+5}; cell 1*st* M_2 relatively short and broad, subquadrate; basal deflection of Cu_1 at or just beyond the fork of *M*.

Abdomen dimidiate, the base of each segment yellow, the apex brown, this becoming more restricted on the subterminal segments. Male hypopygium with the caudal margin of the ninth tergite only gently concave, the median area with only four or five setæ. Basistyles with mesal lobe oval, provided with numerous setæ, including about five long, powerful ones; ventral dististyle very large and fleshy,

the rostrum broader basally, the distal half narrower, this portion with a powerful spine that is longer and stouter than the inner spine situated on the declivity that marks the end of the broadened base; apex of rostrum beneath with a few (about six) slender setæ. Dorsal dististyle moderately curved. Gonapophyses appearing as extensive flattened blades, the mesal angle produced into a slender, gently curved lobe, the caudal margin of the apophyse adjoining this lobe weakly crenulate or serrulate.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 19, 1923 (*T. R. Harris*).

Paratopotype, ♂, *paratype*, ♂, Mahinapau, Westland, February 24, 1923 (*T. R. Harris*).

Dicranomyia pendulifera, sp. n.

General coloration shiny brownish yellow, the thoracic pleura dark brown: wings subhyaline, the stigma scarcely darker; male hypopygium with the rostrum pendulous, directed cephalad.

Male.—Length about 4·8 mm.; wing 5·5 mm.

Rostrum brown, the palpi somewhat darker. Antennæ dark brown throughout, the basal flagellar segments suboval, the outer ones becoming more slender. Head dark grey.

Mesonotum shiny brownish yellow, only a little darker medially, the scutellum more testaceous. Pleura dark brown, the sternopleura abruptly paler. Halteres infuscated. Legs with the coxæ and trochanters yellowish testaceous; remainder of the legs dark brown. Wings subhyaline, with a faint greenish tinge, the stigma scarcely darker; veins brown. Venation: Sc_1 ending opposite the origin of *Rs*; *Rs* arcuated, about one-third longer than the basal deflection R_{4+5}; cell *1st* M_2 rectangular, about two-thirds as long as cell *2nd* M_2; basal deflection of Cu_1 at the fork of *M*.

Abdominal tergites dark brown, the sternites and hypopygium somewhat paler. Male hypopygium with the ninth tergite having a U-shaped median notch, the lateral lobes setiferous, the median area with about two setæ. Basistyles with the mesal lobes large and conspicuous. Ventral dististyle very large and fleshy, the rostrum long and slender, directed strongly cephalad, with two spines near its base, these spines subequal in size, the proximal one a trifle longer; dorsal dististyle strongly curved, sickle-shaped. Gonapophyses with the mesal lobe long, the caudal margin of the apophyse appearing to have a U-shaped incision due

to the fact that the lateral angle is produced strongly caudad.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 17, 1923 (*T. R. Harris*).

Molophilus abruptus, sp. n.

Male.—Length about 3·8 mm.; wing 4·8 mm.

Belongs to the *macrocerus* group and is very closely related to *M. remotus*, Alexander, from which it differs as follows:—

Humeral and lateral regions of the præscutum a little paler. Vein *2nd A* ending about opposite mid-length of the petiole of cell M_3. The chief specific distinctions are found in the structure of the male hypopygium. The basal dististyle is much shorter, the basal half stout and straight, the apical half or a little less gradually narrowed into a powerful spine; at the base of this spine on the mesal face a large area of smaller spines; a few additional scattered spines on the mesal face of the apical spine.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 17, 1923 (*T. R. Harris*).

Molophilus acanthus, sp. n.

General coloration yellowish ochreous; antennæ short; basistyles of male hypopygium produced caudad into erect subtruncate lobes; basal dististyle shaped like a ten-pin.

Male.—Length 3·5–3·8 mm.; wing 4·5–4·6 mm.

Female.—Length about 4 mm.; wing 5 mm.

Rostrum and palpi black. Antennæ short in both sexes, the scapal segments obscure testaceous, especially the basal one; flagellar segments dark brown. Head dark brownish grey.

Mesonotum yellowish ochreous, scarcely variegated with darker. Pleura testaceous, the dorsal pleurites somewhat darker. Halteres yellowish, the knobs infuscated except apically. Legs with the coxæ and trochanters concolorous with the pleura; femora yellow with dark macrotrichiæ; tibiæ and tarsi gradually passing into dark brown. Wings strongly tinged with yellow; a conspicuous pale brown cloud along the cord, interrupted along the fork of *M* but faintly shown as a seam along the basal deflection of Cu_1; veins pale, darker in the infuscated areas. Venation: vein *2nd A* ending nearly opposite mid-length of the petiole of cell M_3.

Abdomen dark brown, the hypopygium obscure testaceous yellow. Male hypopygium of the general structure of the *tillyardi* group. Basistyles produced caudad into erect subtruncate lobes, the apex terminating in two blunt, blackened teeth which extend down the face of the lobe as chitinized and feebly serrulate ridges, the area between concave. Outer dististyle trifid, the outer lobe larger, the two inner lobes more slender. Basal dististyle shaped somewhat like a ten-pin, broadly dilated on basal two-fifths, the distal three-fifths slender, blackened, nearly straight, toward the tip with a few weak denticles. Ædeagus curved at apex.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 21, 1923 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, 20 ♂ ♀, February 21–23, 1923; *paratypes,* 1 ♂, Greymouth, Westland, February 11, 1923; 5 ♂ ♀, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Amphineurus (*Nothormosia*) *tortuosus*, sp. n.

Closely allied to *A. subglaber,* Edwards; wings narrow, the basal section of R_2 subperpendicular; outer dististyle of male hypopygium a short flattened blade, the apex obtuse.

Male.—Length about 3·6 mm.; wing 4·6 mm.

Rostrum and palpi dark brown. Antennæ broken. Head dark brownish grey.

Mesonotum light brown without distinct markings. Pleura yellowish brown. Halteres dark brown, the base of the stem obscure yellow. Legs with the coxæ yellowish brown; trochanters testaceous; remainder of legs dark brown, the femoral bases paler. Wings narrow, strongly tinged with brown, the veins darker brown. Venation: R_{2+3} about as long as the basal deflection of Cu_1 and gently arcuated; basal section of R_2 subperpendicular, about twice r; basal deflection of R_{4+5} and r–m subequal; petiole of cell M_3 about one-half longer than the basal deflection of Cu_1.

Abdomen light brown, including the hypopygium. Male hypopygium with the ninth tergite only feebly chitinized, with a caudal U-shaped median notch, each lateral lobe with a small rounded apical notch. Basistyle produced caudad into a moderately long, fleshy lobe. Outer dististyle shorter than this lobe, appearing as a flattened blade, the apex obtuse. Inner dististyle blackened, suddenly narrowed near mid-length, the slender apex curved gently mesad.

Basal dististyle a slender chitinized rod, somewhat as in *A. recurvans*, Alexander, the apex strongly curved, sinuous. Gonapophyses flattened, rather weakly chitinized.

Hab. New Zealand (South Island).

Holotype, ♂, Greymouth, Coal Creek Track, February 13, 1923 (*T. R. Harris*).

Amphineurus flexuosus, sp. n.

Related to *A. molophilinus*, Alexander; male hypopygium with the basal dististyle weakly toothed toward apex; gonapophyses very slender, blackened on distal half.

Male.—Length about 5 mm.; wing 6 mm.

Female.—Length 6·5 mm.; wing 6–6·2 mm.

Rostrum and palpi brownish black. Antennæ relatively long, if bent backward, extending about to the base of the abdomen, brownish black throughout. Head dark greyish black, the ground-colour almost concealed by abundant white setæ.

Mesonotum and pleura greyish black, the interspaces and pleura very heavily covered by dense whitish setæ. Halteres pale brown, the knobs dark brown. Legs with the coxæ concolorous with the pleura; trochanters and femora orange; tibiæ similar, a little darkened at tip; tarsi black; segments of leg provided with abundant setæ that tend to obscure the ground-colour. Wings with a strong brown tinge, the stigmal area conspicuously light yellow; membrane almost concealed by abundant brown and black macrotrichiæ distributed to produce a somewhat variegated appearance; costal fringe tawny; anal fringe double, black. Venation: *Rs* long-spurred at origin; cell R_3 sessile; basal deflection of Cu_1 immediately before the fork of *M*.

Abdomen greyish black, the colour almost concealed by dense cream-coloured setæ. Male hypopygium of the general structure of *A. perdecorus*, Edwards, and *A. submolophilinus*, Alexander; basistyles produced caudad into elongate, attenuate, pale apices; basal dististyle slender, brownish yellow at base, the blackened apex with a few conspicuous teeth. Gonapophyses lyriform, yellowish basally, near mid-length suddenly narrowed into a slender black apex that is gently bent immediately before apex.

Hab. New Zealand (South Island).

Holotype, ♂, Greymouth, Coal Creek Track, Westland, February 13, 1923 (*T. R. Harris*).

Allotopotype, ♀.

Paratopotypes, ♂ ♀ in copula, 1 additional ♂.

Amphineurus flexuosus minor, subsp. n.

Very similar to the typical form but smaller (male, length about 4 mm.; wing 5 mm.) and with the genitalia slightly different in form. Gonapophyses with the extreme tips slightly upcurved to produce a sinuous appearance. The basal two-thirds of the basal dististyle are brighter yellow and the subapical teeth are larger and more conspicuous.

Hab. New Zealand (South Island).

Holotype, ♂, Ross, Westland, February 19, 1923 (*T. R. Harris*).

Paratopotypes, 2 ♂♂.

Amphineurus tumidus, sp. n.

General coloration dark brown, the mesonotal præscutum and scutum shiny reddish brown; halteres with the knobs yellow; wings tinged with greyish yellow, covered with abundant dark macrotrichiæ; male hypopygium with the gonapophyses very tumid, lyriform.

Male.—Length 4·8–5 mm.; wing 5·6–6 mm.

Rostrum and palpi dark brown. Antennæ of moderate length, the basal segment of the scape obscure yellow; remainder of antenna dark brown. Head brownish grey, with abundant flattened setæ.

Mesonotal præscutum shiny reddish brown, the lateral margins darker brown; scutal lobes reddish brown; scutellum and postnotum dark brown. Pleura dark brown with an indistinct paler area immediately above the mid-coxæ. Halteres brown, the extreme base of the stem and the knobs conspicuously light yellow. Legs with the coxæ and trochanters obscure yellow; femora obscure yellow, densely clothed with brown setæ to almost conceal the ground-colour; tibiæ and tarsi passing into darker brown. Wings tinged with greyish yellow and densely covered with dark macrotrichiæ; veins yellow and brown. Venation: cell R_2 very short-petiolate to subsessile; basal deflection of Cu_1 close to proximal end of cell 1*st* M_2.

Abdominal tergites dark brown, the sternites and pleural membrane brownish yellow; hypopygium dark brown, the attenuate apices of the basistyles a little paler. Male hypopygium having the general structure of *M. senex* and allies. Basistyles attenuate; outer dististyles two, the lower flattened, sometimes with a small marginal spine near mid-length, and with the subtruncate apex feebly serrulate; basal dististyle slender, almost straight, the base a little

enlarged, gradually narrowed to the attenuate acute apex which is narrowly blackened. Gonapophyses very powerful and swollen, somewhat lyriform in shape, thickest beyond mid-length, the apex abruptly narrowed into a long apical spine that is surrounded by a dense tuft of setæ.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Paratopotypes, 2 ♂ ♂.

Limnophila, Macquart.

Subgenus Paralimnophila, Alexander.

1921. *Paralimnophila*, Alexander, Ann. & Mag. Nat. Hist. (9) viii. pp. 559–560.

The subgeneric term *Paralimnophila* was proposed in 1921, with *Limnophila leucophæta*, Skuse, as type. The accession of three new species described herewith requires a modification of the subgeneric definition. The number of antennal segments varies from 16 to 18, with the basal flagellar segments rather strongly serrate in both sexes, where these are known. The legs are bicolorous only in the *leucophæta* group (*cairnensis*, Alexander, and *serraticornis*, sp. n.). The relative position of *r* and the basal deflection of Cu_1 vary with the species, in *L.* (*P.*) *fergusoni*, sp. n., *r* being at the tip of R_1 and the basal deflection of Cu_1 near mid-length of cell 1*st* M_2. It is possible that the latter species should be removed from the group under consideration, but until male specimens of more of the species are discovered it is inadvisable to divide the group more closely. There can be no question but that the present group and the Tasmanian *Xenolimnophila*, Alexander, are connecting units between *Limnophila* and *Gynoplistia*.

Limnophila (*Paralimnophila*) *fergusoni*, sp. n.

General coloration shiny reddish brown, varied with black; femora obscure yellow with brownish-black premedial and subterminal rings; wings whitish hyaline, handsomely cross-banded with dark brown.

Male.—Length 21 mm.; wing 19·5 mm.; hind leg, femur 14·5 mm, tibia 18·6 mm.

Female.—Length 24 mm.; wing 17 mm.

Rostrum and palpi reddish orange. Antennæ 17-segmented in both sexes; apex of each of the basal flagellar segments slightly produced, giving to the organ a slightly serrate appearance. Head rich chestnut-brown, subshiny, strongly narrowed behind.

Mesonotal præscutum dark brown with three bright reddish-brown stripes that cover most of the surface, the median stripe indistinctly divided by a capillary darker line; scutum darkened, the lobes extensively reddish brown; scutellum dark brown; postnotum with the medio-tergite pale reddish with a capillary brown median vitta, the pleurotergites extensively darkened and sparsely pruinose. Pleura reddish brown. Halteres pale, the knobs infuscated. Legs with the coxæ and trochanters reddish brown; femora obscure yellow with a broad brown ring before mid-length and a narrower brownish-black subterminal ring, the extreme apex pale; tibiæ light brown, the extreme tips blackened; tarsi brownish black. Wing whitish hyaline; cells *C* and *Sc* brownish black, except a narrow margin adjoining costa which is pale; membrane heavily cross-banded with dark brown; in some specimens a conspicuous area at the wing-base in cells *R* and *M*, continued as a seam along vein *Cu*, sending a conspicuous branch caudad, this including the middle of cell *Cu* and the outer ends of cells 1*st A* and 2*nd A*; a spot at origin of *Rs* (smaller in type ♂); a conspicuous band extending from the concolorous stigma across the wing, leaving the centre of cell 1*st* M_2 narrowly pale; wing-apex broadly darkened; anal and posterior margin of wing very narrowly seamed with brown; veins dark brown, paler in the hyaline areas. Venation: *Sc* long, Sc_1 ending beyond the base of R_2, Sc_2 near its tip; *r* at the tip of R_1; an indistinct spur on R_2 near origin; *Rs* elongate; R_{2+3} shorter than the basal deflection of R_{4+5}; cell M_1 longer than its petiole; cell 1*st* M_2 short-rectangular, the basal deflection of Cu_1 near mid-length; arculus complete.

Abdominal tergites shiny chestnut-brown, narrowly trilineate with black, the median stripe narrowly interrupted at the posterior margins of the segments; sternites somewhat similar, but the black areas more diffuse; hypopygium dark. Ovipositor with the valves elongate.

Hab. New South Wales.

Holotype, ♂, Mt. Kosciusko, December 17, 1922 (*Goldfinch*).

Allotopotype, ♀, December 5, 1921 (*E. W. Ferguson*).

Paratopotype, ♀, with the allotype.

Types returned to the Health Department of New South Wales.

This elegant crane-fly is named in honour of Dr. E. W. Ferguson, to whom I am indebted for critical co-operation in a study of Australian Tipulidæ.

Limnophila (*Paralimnophila*) *aurantiipennis*, sp. n.

General coloration orange; wings orange, the costal cell dark brown.

Female.—Length 17–18 mm.; wing 15–16 mm.

Rostrum and palpi brown. Antennæ 16-segmented, the basal six segments with their lower apical angles produced into a short branch; scape and basal flagellar segments light brown, the terminal segments passing into dark brown. Head strongly narrowed posteriorly and transversely wrinkled, reddish brown, sparsely grey-pruinose.

Pronotum and mesonotum orange, the præscutum with three reddish-brown stripes, the extreme cephalic end of the median stripe darker and more clearly indicated; scutellum slightly darkened. Pleura orange. Halteres brown, the extreme base of the stem and the knobs indistinctly paler. Legs with the coxæ and trochanters reddish orange; femora brown, the subglabrous bases obscure yellow; tibiæ and tarsi dark brown. Wings strongly suffused with orange, the costal cell conspicuously dark brown; small brown spots at origin of *Rs* and at tips of veins R_1 and R_2; stigma very pale brown; veins yellow. Venation: Sc_1 ending just before the end of R_{2+3}, Sc_2 not far from its tip; *Rs* very long, in alignment with R_{2+3}; cell M_1 about one-half longer than its petiole; cell 1*st* M_2 subrectangular, gently widened distally; basal deflection of Cu_1 not far beyond its inner end.

Abdomen obscure orange-brown. Ovipositor with the tergal valves very long and slender, horn-coloured.

Hab. New South Wales.

Holotype, ♀, Blue Mountains, March 4, 1922 (*E. W. Ferguson*).

Paratopotype, ♀, January 7, 1922 (*E. W. Ferguson*).

Type returned to the Health Department of New South Wales.

Limnophila (*Paralimnophila*) *serraticornis*, sp. n.

General coloration light grey, the præscutum with three brown stripes; antennæ 18-segmented, the basal flagellar segments serrate beneath; tips of femora and most of tarsi white; wings tinged with brown, with a sparse darker brown pattern.

Female.—Length 15–17 mm.; wing 14·5–15·5 mm.

Rostrum and palpi black. Antennæ 18-segmented, black throughout, the basal segment pruinose; basal 9 or 10

flagellar segments produced at apex beneath into a conspicuous lobe, the organ thus appearing strongly serrate; terminal flagellar segments simple, the last elongate. Head dark grey, the vertex with a triangular brown mark with its point directed caudad.

Mesonotal præscutum light grey, with three conspicuous brown stripes; a capillary median vitta and the interspaces still darker brown; scutal lobes brown, the median area weakly pruinose; scutellum brownish medially; postnotum light grey with a capillary brown vitta that is clouded with paler brown at its cephalic end. Pleura light grey-pruinose, the dorsal pleurites darker. Halteres dark brown, the stem pale. Legs with the coxæ and trochanters dark grey-pruinose; femora brown, on the posterior legs soon passing into black, on the fore and middle legs with the pale bases very extensive; extreme tips of femora abruptly pinkish white; tibiæ brownish black; metatarsi black with about the apical fourth or a little less creamy-white; terminal tarsal segments infuscated to blackened; paired spurs at tips of tarsal segments 1 and 2. Wings tinged with brown, more marked in the anal and cubital cells; cells *C* and *Sc* dark brown; a rather sparse dark brown pattern, distributed as follows: at origin of *Rs* and on vein *R* at mid-distance between arculus and origin of *Rs*; stigma; smaller brown spots at forks of *Rs*, R_{2+3}, M_{1+2}; along the cord and at the distal end of vein R_2; wing-apex faintly darkened; veins brownish black. Venation: Sc_1 ending just before the tip of R_{2+3}, Sc_2 opposite the end of *Rs*; *Rs* nearly straight; *r* about three times its length before the arcuated distal section of R_1; cell M_1 from two to two and one-half times the length of its petiole; basal deflection of Cu_1 close to proximal end of cell 1*st* M_2.

Abdomen dark brown, grey-pruinose. Ovipositor with the slender elongate tergal valves horn-coloured, their bases darker.

Hab. New South Wales.

Holotype, ♀, Blue Mountains, January 7, 1922 (*E. W. Ferguson*).

Paratopotype, ♀, January 29, 1922.

Type returned to the Health Department of New South Wales.

Limnophila (*Metalimnophila*) *apicispina*, sp. n.

Male.—Length about 5·5 mm.; wing 6·2 mm.

Generally similar to *L.* (*M.*) *simplicis*, Alexander, differing as follows:—

General coloration paler. Flagellar segments a little shorter. Mesonotal præscutum with three darker stripes, the broad median stripe grey, margined with darker; lateral stripes brown; lateral margins of præscutum and interspaces behind greyish; humeral region and anterior interspaces light ochreous. Femora stouter, the tips less darkened. Male hypopygium of the simple structure of *L. simplicis*, the outer dististyle bottle-shaped, terminating in a powerful acute spine, the mesal face of the style very densely set with long erect setæ; inner style short and broad, the apex narrowed. Mesal face of basistyle with oblique parallel rows of conspicuous setæ. Gonapophyses small, scoop-like, each with a marginal spine.

Hab. New Zealand (South Island).

Holotype, ♂, Greymouth, Coal Creek Track, Westland, February 13, 1923 (*T. R. Harris*).

Limnophila latistyla, sp. n.

General coloration brown, the thoracic pleura light grey; antennæ short; wings relatively narrow, distinctly tinged with brown; Sc_2 at extreme tip of Sc_1; male hypopygium with inner dististyle very short and broad.

Male.—Length about 3·8 mm.; wing 4·5 mm.

Rostrum and palpi dark brown. Antennæ short, brownish black, the first segment dusted with grey; flagellar segments oval, with moderately long verticils. Head dark grey.

Pronotum and mesonotum brown, unmarked; pseudosutural foveæ black; tuberculate pits opposite the foveæ. Pleura and postnotum dusted with grey. Halteres pale, the knobs a little darker. Legs with the coxæ and trochanters light brown; remainder of legs brownish black, the femoral bases a little brighter. Wings relatively narrow, distinctly tinged with brown, the elongate-oval stigma a little darker brown; veins dark brown. Venation: *Sc* long, ending opposite from four-fifths to five-sixths the length of *Rs*, Sc_2 at the extreme tip of Sc_1; *Rs* elongate; *r* subobsolete; R_{2+3} shorter than the deflection of R_{4+5}; cell M_1 about two-thirds the length of its petiole; cell 1*st* M_2 small, rectangular; basal deflection of Cu_1 before mid-length of cell 1*st* M_2.

Abdomen dark brown, sparsely pruinose; sternites a little paler; hypopygium yellow. Male hypopygium with each basistyle elongate; dististyles two, the outermost more slender, chitinized, terminating in a powerful chitinized spine, with a smaller tooth on outer margin at base of apical spine; outer portion of style with setiferous tubercles; inner dististyle very broad, plate-like, the apex produced

into a slender beak that terminates in a conspicuous seta. Gonapophyses slender, gently curved, directed chiefly caudad and mesad.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Limnophila nebulifera, sp. n.

General coloration brownish black; antennæ short; legs black, the femoral bases narrowly obscure yellow; wings cream-coloured, very extensively suffused with brown, the ground-colour reduced to small scattered spots; Sc_1 equal to R_{2+3}.

Male.—Length about 4·5 mm.; wing 5·6 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown throughout; verticils relatively conspicuous. Head dark brown.

Mesonotum brownish black without markings. Pleura dark brown. Halteres brown, the knobs slightly paler. Legs with the coxæ and trochanters brown; remainder of the legs black, the femoral bases narrowly obscure yellow, more extensive on the fore legs. Wings cream-coloured, very extensively clouded with brown to almost obliterate the ground-colour; stigma slightly darker brown; the spots of the ground-colour are as follows:—in cell *R* before and beyond the origin of *Rs*; before and beyond the stigma; in cells R_2, R_3, and R_5; near outer end of cell *M*: in outer ends of cells *Cu*, 1*st A*, and 2*nd A*; veins dark brown. Venation: *Sc* long, Sc_1 ending just before the end of *Rs*, Sc_2 some distance from its tip, Sc_1 alone about equal to R_{2+3}; veins R_2 and R_3 divergent; inner ends of cells R_3, R_5, and 1*st* M_2 in approximate alignment; cell M_1 subequal to its petiole; basal deflection of Cu_1 before mid-length of cell 1*st* M_2.

Abdomen brownish black. Male hypopygium with the apex of basistyle produced caudad into a slender fleshy lobe that is about as long as the inner dististyle. Outer dististyle a relatively slender, chitinized rod, gently dilated distally, the apex terminating in a spine, before the apex with numerous appressed setæ and spinulæ; inner dististyle short and stout, fleshy, provided with abundant elongate setæ. Gonapophyses directed caudad, appearing as irregular, flattened, chitinized blades.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

HARRISOMYIA, gen. nov.

Antennæ presumably with 16 segments, the terminal flagellar segments broken; second scapal segment oval, tumid; flagellar segments with long verticils. Wings with *Sc* relatively short, ending a short distance beyond mid-length of the long *Rs*; cell R_2 small, R_{2+3} about one-half longer than R_2; *r* lacking; cell M_1 lacking; cell *2nd* M_2 sessile, *m* being obliterated by the approximation of adjoining veins. Tibial spurs setiferous at base; claws simple; empodia distinct. Male hypopygium with basistyles simple, short and stout; dististyles two, the outer chitinized, bidentate at apex; gonapophyses slender, bent at a right angle near mid-length, not curved.

Genotype, *Harrisomyia bicuspidata*, sp. n. (Maorian Subregion).

This interesting group of Hexatomine crane-flies is named in honour of Mr. Thomas R. Harris, whose untiring efforts have done so much to make known the remarkable Tipuloidean fauna of New Zealand. The genus is apparently allied to *Zelandomyia*, Alexander, from which it differs in venational and genitalic characters. The gonapophyses are bent at a right angle near mid-length but lie in a single plane, in *Zelandomyia* being twisted or curved. I would now modify the definition of *Zelandomyia* to include several New Zealand Tipulidæ described as species of *Limnophila*, including *L. angusta*, Alexander, *L. cinereipleura*, Alexander, *L. deviata*, Alexander, *L. otagensis*, Alexander, *L. ruapehuensis*, Alexander, and *L. watti*, Alexander.

Harrisomyia bicuspidata, sp. n.

General coloration brown, the præscutum darker medially; wings faintly tinged with brown; cell R_2 small; cell M_1 lacking; *m* obliterated by the approximation of adjoining veins.

Male.—Length about 3·8 mm.; wing 4·3 mm.

Rostrum dark brown, the palpi brownish black. Antennæ short, dark brown throughout. Head dark brown, sparsely dusted with dark grey.

Pronotum dark brown. Mesonotal præscutum brown, subshiny, the median area broadly dark brown, the lateral margins obscure yellow. Pleura rather dark brown. Halteres brown, the base of the stem narrowly yellow. Legs with the coxæ testaceous; remainder of the legs brownish testaceous, the terminal tarsal segments darker; legs moderately hairy. Wings faintly tinged with brown, the

stigma a little darker brown; veins dark brown. Venation: *Sc* relatively short, Sc_1 ending near three-fifths the length of *Rs*, Sc_2 a short distance from the tip of Sc_1; distance on costa between the tips of veins R_1 and R_2, shorter than the basal deflection of Cu_1; inner ends of cells R_3, R_5, and 1*st* M_2 in alignment; *m* obliterated by contact of M_{1+2} and M_3; basal deflection of Cu_1 about one-fourth its length beyond the fork of *M*.

Abdomen brown, including the hypopygium. Male hypopygium with the basistyles relatively short and stout; dististyles two, the outer style relatively short and stout; flattened, terminating in a long straight tooth, with a smaller but conspicuous lateral tooth on the outer face before the apex. Inner style a little longer than the outer, stout and fleshy, with setiferous tubercles, terminating in a powerful elongate seta. Gonapophyses relatively slender, chitinized, each bent at a right angle near mid-length, the long straight apex directed mesad, the tips being decussate or nearly so.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Gynoplistia nigrobimbo, sp. n.

General coloration shiny coal-black; antennæ 15-segmented; wings subhyaline with a sparse brown pattern; cell M_1 present; male hypopygium with the basistyles produced into a slender digitiform lobe that is about equal in length to the style itself.

Male.—Length 3·5–3·8 mm.; wing 4–4·5 mm.

Rostrum black, the palpi dark brown. Antennæ 15-segmented, the formula being 2+2+7+4; basal segment of scape brownish black, second segment brown; rhachis of basal two flagellar segments obscure brownish yellow; remainder of antennæ black; antennal flabellations elongate, the longest exceeding one-half the length of the flagellum. Head shiny coal-black.

Mesonotum and pleura shiny coal-black; very small areas of microscopic grey pubescence on meron and pteropleurite. Halteres yellow, the knobs infuscated. Legs with the coxæ yellow, faintly infuscated; trochanters obscure yellow; legs brownish black, the femoral bases extensively obscure yellow. Wings subhyaline, with a sparse brown pattern, including a spot at origin of *Rs*; stigma and a seam therefrom along the cord and outer end of cell 1*st* M_2; a cloud

near outer end of cell 1*st A*; veins dark brown. Venation: *Rs* rather long, feebly angulated at origin; cell 1*st* M_2 subpentagonal; cell M_1 equal to or shorter than its petiole; basal deflection of Cu_1 at or beyond mid-length of cell 1*st* M_2.

Abdomen black, including the hypopygium. Male hypopygium with the apical angle of basistyle produced caudad into a slender, straight, digitiform lobe that is about as long as the basistyle or inner dististyle, the apex broadly glabrous; mesal face of basistyle produced mesad and caudad into a conspicuous flattened pale blade whose outer margin near apex is microscopically serrulate. Dististyles two, the outer one glabrous, broad basally, gradually narrowed to the slender obtuse apex; inner style weakly setiferous toward apex. Gonapophyses simple, broad-based, gradually narrowed to the slender, nearly acute apices.

Hab. New Zealand (South Island).

Holotype, ♂, Greymouth, Coal Creek Track, Westland, February 13, 1923 (*T. R. Harris*).

Paratopotype, ♂.

Gynoplistia bucera, sp. n.

General coloration shiny black; antennæ 15-segmented, the branches relatively short; wings subhyaline, with an extensive brown pattern; cell M_1 lacking; male hypopygium with mesal face of basistyle produced into a slender curved horn.

Male.—Length 5·5–6 mm.; wing 5·5–6 mm.

Rostrum and palpi black. Antennæ 15-segmented, the formula being 2+2+6+5; antennæ black throughout; flagellar branches relatively short, the longest less than one-half the length of flagellum. Head shiny coal-black.

Mesonotum and pleura shiny coal-black; a longitudinal strip of brownish-grey microscopic pubescence extends from behind the fore coxæ to just before the wing-root; caudal margin of pteropleurite punctured. Halteres dark brown. Legs with the coxæ shiny brownish black; trochanters a little paler; remainder of legs black, the femoral bases extensively yellow, narrowest on fore legs where the basal third is included, broadest on posterior legs where the basal two-thirds is included; femoral tips swollen, especially those of posterior legs. Wings subhyaline with an extensive but relatively clear-cut brown pattern, including the bases of cells *R* and *M*, extending distad in cell *M* to

opposite the origin of *Rs*, thence deflected caudad into cells *Cu* and 1*st A* ; a conspicuous circular spot at origin of *Rs* ; a broad band extending from stigma along the cord to the posterior margin of wing, the centre of cell 1*st* M_2 remaining pale ; wing-apex broadly darkened ; veins dark brown. Venation : *Rs* long, angulated at origin ; cell M_1 lacking ; basal deflection of Cu_1 before mid-length of the rectangular cell 1*st* M_2.

Abdomen shiny black with violaceous reflexions. Male hypopygium with the dorsal angle of basistyle produced caudad into a powerful black conical tooth that is glabrous or nearly so, at its base on mesal face of style with a conspicuous curved horn ; ventral apical angle of style produced into a pale, broadly rounded, setiferous blade. Dististyles two, broad, the inner one setiferous. Gonapophyses slender, the base of each dilated, gradually narrowed to the acutely pointed apex.

Hab. New Zealand (South Island).

Holotype, ♂, Rewanui, Paparoa Range, Westland, altitude 600–800 feet, February 15, 1923 (*T. R. Harris*).

Paratopotypes, 2 ♂ ♂.

XLIII.—*Les* Trechinæ [*Coleoptera*, Carabidæ] *de la Région Orientale.* Par le Dr. A. Jeannel.

On connaissait jusqu'à présent bien peu de Trechinæ de la région orientale, et le présent travail a pour but de faire connaître toute une série de genres et d'espèces nouvelles de cette région. Cette première énumération fixera l'état actuel de nos connaissances sur les Trechinæ orientaux et pourra servir de base à des travaux futurs, car il est bien certain que les explorations de l'Himalaya, à peine ébauchées jusqu'à ce jour, doivent amener la découverte de quantité d'autres espèces aptères plus ou moins localisées, comparables à celles qui peuplent nos massifs montagneux de l'Europe.

Les matériaux les plus importants dont j'ai pu disposer pour cette étude, m'ont été soumis par M. H. E. Andrewes, qui les avait lui-même reçus du Forest Research Institute à Dehra Dun et de ses amis MM. H. G. Champion et H. Stevens.

Qu'il me soit donc tout d'abord permis de remercier chaudement ici M. H. E. Andrewes de la confiance qu'il a

bien voulu me témoigner en me chargeant de décrire ces Trechinæ.

Deux espèces ont été décrites par Motschoulsky comme appartenant au groupe des Trechinæ, mais d'une façon si insuffisante qu'il est impossible d'en tenir compte. Ce sont le *Trechus fasciatus* des Indes Orientales et le *Tachynotus castaneus* de Ceylan.

Le *Trechus fasciatus*, Motsch., 1851, Bull. Soc. Imp. Nat. Moscou, iv. p. 506 (type : Indes Orientales), aurait les élytres marqués de "quatre stries très imprimées de points enfoncés, que n'atteignent pas l'extrémité et avec une seule fovéole sur la 4e strie vers le milieu." On peut douter d'après cela qu'il s'agisse d'un *Trechus* et d'ailleurs la coloration "testacée, avec la partie postérieure de la tête et une large bande transversale sur les élytres, noires" me font supposer qu'il s'agit peut-être d'un *Perigona* ressemblant au *P. ruficollis*, Motsch., de Ceylan. En tout cas, la laconique diagnose de Motschoulsky ne peut s'appliquer à aucune des espèces énumérées plus loin.

Quant au *Tachynotus castaneus*, Motsch., 1861, Bull. Soc. Imp. Nat. Moscou, xxxiv. p. 100 (type : Colombo), il ne m'est pas possible, d'après sa description, de faire la moindre supposition à son sujet. Ses "impressions longitudinales du front arquées" et son "dernier article des palpes maxillaires en alène et un peu plus long que l'avant-dernier" sembleraient indiquer qu'il doive se placer parmi les Trechinæ ; mais la description que donne Motschoulsky n'énumère que de vagues caractères généraux communs à une foule de Carabiques de groupes divers, ce qui fait qu'on est aussi bien en droit de supposer qu'il peut s'agir de tout autre chose que d'un *Trechus*. La taille du *Tachynotus* (3·2 mm.), sa forme "ovalaire du *Tachys rufescens*" montrent qu'il n'a certainement rien de commun avec le *Perileptus ceylanicus*, Nietn.

Les Trechinæ orientaux actuellement connus se classent dans quatre groupes phylogéniquement bien distincts.

Les Perileptini sont représentés dans le nord de l'Inde par un nombre d'espèces relativement considérable, alors que nulle part ailleurs dans toute l'aire de répartition du groupe, deux espèces de *Perileptus* ne coexistent dans les mêmes localités. Cette richesse en espèces et aussi la présence de genres différenciés (*Neoblemus*) semblent indiquer que l'Inde a constitué un centre de dispersion important pour les espèces de la tribu. D'ailleurs les *Perileptus* sont un groupe très ancien. Le genre est en effet très exactement réparti

sur les restes du continent de Gondwana, indo-africano-australien, ce qui le date au moins du Crétacé, et les très étroites affinités des *P. testaceus* d'Abyssinie, *P. promontorii* du Cap et *P. constricticeps* d'Australie, montrent bien que le type morphologique *Perileptus* n'a pas varié depuis cette époque ancienne. D'autre part, le fait que le *P. areolatus* paléarctique, certainement issu d'une lignée orientale, est représenté dans les îles Canaries, prouve encore que c'est au moins dans la première moitié du Tertiaire que cette espèce a dû se répandre en Eurasie.

Un deuxième groupe de Trechinæ est représenté dans la région orientale par le *Trechodes cauliops*, de Birmanie. Ce groupe doit constituer une tribu indépendante, mais je me réserve de la caractériser ultérieurement, lorsque j'aurai à publier les descriptions de ses principaux représentants en Australie et en Afrique. Ce groupe est encore un reste de la vieille faune du continent de Gondwana, et la distribution actuelle du genre *Trechodes* se montrera très instructive à cet égard.

Tous les autres Trechinæ orientaux connus appartiennent enfin à la tribu des Trechini (Jeannel, Ann. Soc. ent. Fr. 1921, p. 166) et font partie des deux séries phylétiques de *Trechus* et de *Duvalites*. Leur histoire géologique est toute différente de celle des *Perileptus* et des *Trechodes*.

Le genre *Trechus*, au sens restreint que je lui ai donné (*l. c.* p. 170), constitue un très grand genre distribué dans les régions paléarctique et néarctique, orientale et australienne. Il est assez difficile de préciser le point du globe où le type *Trechus* a pris naissance ; mais il est bien vraisemblable que ce doit être, comme pour beaucoup d'autres groupes, sur le continent de l'Angara, les lignées australiennes s'étant détaché de la souche primitive vers la fin du Secondaire ou le début de Tertiaire. Les *Trechus* orientaux, qui d'ailleurs présentent quelques analogies avec ceux d'Australie, seraient donc d'anciens endémiques. Rien d'étonnant par conséquent à ce qu'ils aient peuplé l'Himalaya pendant le Néogène, absolument comme les lignées occidentales ont peuplé les Pyrénées, les Alpes, les Carpathes, le Caucase. Les quelques espèces aptères de l'Himalaya, décrites plus loin, sont tout à fait comparables aux espèces alpines et subalpines de l'Europe et il faut s'attendre à ce que les chaînes du sud de l'Asie centrale se montrent habitées par d'énormes quantités d'espèces de *Trechus* étroitement localisées. Sachant de plus que les Trechinæ sont les Carabiques qui s'élèvent le plus haut sur les mon-

tagnes de l'Afrique Orientale (4500 m.) et aussi ceux qui s'avancent le plus loin vers le sud dans l'Antarctique (île Crozet), on peut aussi prévoir qu'ils auront dans l'Himalaya une répartition verticale d'une amplitude considérable.

Il existe un *Trechus* aptère dans l'île de Luzon, de l'archipel des Philippines. Le fait que cette espèce appartient à la même lignée que les espèces alpines de l'Himalaya est particulièrement intéressant, car il est une preuve que des connexions continentales relativement récentes ont existé entre Luzon et le sud de l'Asie. Les rapports phylogéniques du *T. bakeri* de Luzon avec les espèces himalayennes sont du même ordre que ceux des *Trechus* canariens avec les espèces du groupe de *T. quadristriatus* (Jeannel, Bull. Soc. Sc. nat. Maroc, ii. [1922], p. 15).

Enfin la série phylétique de *Duvalites* est représentée dans la région orientale par les deux genres nouveaux, *Agonotrechus* et *Stevensius*. On sait que les *Duvalites* ont à peu près la même histoire géologique que les *Trechus* ; on les connait de l'Asie centrale (*D. bodoanus*) et ils sont abondamment représentés en Europe, où leurs espèces sont actuellement en train de disparaître de la faune épigée, quelques-unes, oculées, se trouvant réléguées dans les massifs de refuge, la plupart, aveugles, étant devenues endogées ou cavernicoles. Les *Agonotrechus* orientaux sont certainement les survivants d'une ancienne lignée orientale, contemporaine de celle des *Duvalites* et qui a survécu dans la faune épigée. Quant à *Stevensius*, certainement une des plus remarquables découvertes de M. H. Stevens, il constitue un type nouveau, fort curieux, qui semble bien devoir remplacer les *Duvalites* oculés d'Europe sur les hautes altitudes de l'Himalaya.

Les types des espèces nouvelles décrites dans ce travail sont déposés au British Museum, sauf indication contraire.

Trib. Perileptini, Jeannel.

Gen. Perileptus, Schaum.

Perileptus, Schaum, 1860 ; type : *P. areolatus*, Creutzer (Jeannel, Ann. Soc. ent. Fr. 1921, p. 341).—Synon. : *Ochthephilus*, Nietner, 1857 ; type : *O. ceylanicus*, Nietn. [nom préoccupé par *Ochthephilus*, Mulsant et Rey, 1856 ; type : *O. flexuosus*, M. et R. (=*Ancyrophorus*, Kraatz)].

Tableau des Espèces Orientales.

1 (10). Pronotum cordiforme, à angles antérieurs arrondis et effacés. Stries des élytres entières, superficielles, à ponctuation effacée.

2 (5). Base du pronotum aussi large que les deux tiers du sommet, les angles postérieurs grands, droits, non saillants en dehors, les côtés de la base presque perpendiculaires à la ligne médiane.

3 (4). Tête brunâtre sur le disque, élytres testacés concolores. Long. 2·6 à 2·8 mm. ..... *japonicus*, Bates.

4 (3). Tête testacée, élytres testacés avec l'apex et le bord externe noirâtre. Long. 3·5 mm. *robustus*, sp. n.

5 (2). Base du pronotum moins large que les deux tiers du sommet, les angles postérieurs petits, obtus ou aigus, saillants en dehors, les côtés de la base très obliques ou échancrés entre l'angle et le pédoncule.

6 (7). Forme étroite et allongée, très déprimée. Pronotum étroit à côtés peu arqués, longuement sinués en arrière. Long. 2·5 à 3 mm. ..... *indicus*, sp. n.

7 (6). Forme plus large. Pronotum transverse, à côtés très arrondis, la sinuosité basale très courte et brusque.

8 (9). Pronotum convexe. Elytres sans reflet bronzé. Long. 2·5 mm. ..... [Nietn. *ceylanicus*,

9 (8). Pronotum déprimé. Elytres à reflet bronzé. Long. 2·2 à 2·3 mm. ..... *pusillus*, sp. n.

10 (1). Pronotum trapézoïde à angles antérieurs très saillants. Stries des élytres entières, à ponctuation forte et profonde.

11 (16). Elytres parallèles, déprimés, à pubescence disposée sans ordre. Rougeâtres.

12 (13). Elytres très aplatis, avec les pores sétigères discaux de la 3e strie distincts. Long. 2·8 mm. ..... [sp. n. *platypterus*,

13 (12). Elytres déprimés sur le disque ; les pores sétigères de la 3e strie nuls.

14 (15). Pronotum plus ample, à côtés plus arrondis. Elytres deux fois aussi longs que larges, à interstries plans. Long. 2·5 à 2·8 mm. *imaicus*, sp. n.

15 (14). Pronotum plus petit, à côtés peu arqués. Elytres longs, plus de deux fois aussi longs que larges, les interstries convexes. Long. 2·8 à 3 mm. ..... *denticollis*, sp. n.

16 (11). Elytres ovalaires, convexes, à pubescence dressée régulièrement alignée sur les interstries. Testacé pâle très brillant avec une tache noirâtre sur la partie postérieure du disque des élytres. Long. 2·6 mm. ..... *cameroni*, sp. n.

Perileptus japonicus, Bates.

Jeannel, 1920, Ann. & Mag. Nat. Hist. ser. 9, vol. v. p. 108.

Cette espèce, commune au Japon, existe aussi dans la région orientale. Elle est connue de Chine, à Hong Kong (coll. Walker) et de l'île Célèbes (*Wallace*) [Brit. Mus.].

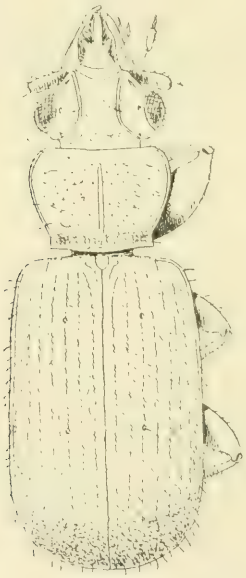
Perileptus robustus, sp. n. (Fig. 1.)

Inde, Himalaya.—Garhwal : Siuni Gad, 1200 m. alt., juin 1920, 1 ex. (*H. G. Champion*).—Kumaon : West Almora, Ranikhet, 3 ex. (*types*) (*H. G. Champion*) ; West Almora, Diva, 1 ex. (*H. G. Champion*).

Long. 3·5 mm.

Epais, parallèle, très peu convexe. Testacé rougeâtre brillant, avec l'extrémité apicale des élytres et une étroite bordure marginale noirâtres, le métasternum et l'abdomen noirâtres, les antennes rembrunies à partir du 4e article, les

Fig. 1.



Perileptus robustus, sp. n., de Ranikhet.

pattes testacées. Pubescence dressée assez courte et peu fournie.

Antennes atteignant à peine le milieu des élytres, épaissies au sommet. Tête robuste, aussi longue que large, assez densément ponctuée sur les joues et le vertex. Epistome unituberculé. Yeux gros, saillants, trois fois aussi longs que les tempes qui sont un peu convexes et obliques.

Pronotum à peine transverse, aussi large que la tête et plus étroit que les élytres, peu rétréci à la base qui est un

peu plus large que les deux tiers du bord antérieur ; côtés bien arrondis en avant, sinués en arrière et parallèles dans leur extrémité basale ; angles postérieurs grands, droits, vifs, non saillants en dehors ; base un peu saillante au dessus du pédoncule mésothoracique, ses parties latérales droites et presque perpendiculaires à la ligne médiane. Disque peu convexe, à ponctuation assez serrée et relativement fine ; gouttière marginale très étroite ; surface basale avec de fortes rugosités ; fossettes petites, profondes, déprimant le bord basal et limitées en dehors par une carène oblique placée sur l'angle postérieur.

Elytres très peu convexes, subparallèles, à peine deux fois aussi longs que larges ; les stries très superficielles, à ponctuation obsolète ; interstries très finement ponctués.

Chétotaxie normale ; les pores discaux de l'élytre sont distincts de la ponctuation des stries.

Cette espèce est la plus grande du genre. Elle est remarquable par sa forme robuste et épaisse et son pronotum ample, à peine transverse, à base large. La forme des angles postérieurs de son pronotum la rapproche du *P. japonicus*, mais par contre l'isole de toutes les autres espèces orientales.

Perileptus indicus, sp. n. (Fig. 2.)

Inde, Himalaya.—Dehra Dun : Chakrata, un ex., mai 1921 (*Dr. M. Cameron*) ; Dehra Dun, 4 ex., déc. 1920 et févr. 1921 (*Dr. M. Cameron*).—Kumaon : West Almora, 11 ex. (*types*) (*H. G. Champion*) ; West Almora, Diva, 2 ex., déc. 1917 (*H. G. Champion*) ; West Almora, Tanakpur, 1 ex. (*H. G. Champion*) ; West Almora, Ranikhet, 1 ex. (*H. G. Champion*).—Sikkim : Darjiling, Gielle Khola, Tista Valley, 1 ex., déc. 1919 (*H. Stevens*).—Eastern Duars, 6 ex. (*H. Stevens*).

Long. 2·5 à 3·2 mm.

Déprimé, étroit et allongé, parallèle. Testacé brillant, parfois un peu rougeâtre, avec la tête et le dessous du corps plus foncés, les pattes pâles, les antennes rembrunies à partir du 3e article. Pubescence courte et rare, irrégulière. Téguments très finement alutacés.

Antennes atteignant le milieu des élytres, un peu épaissies au sommet. Tête aussi large que le pronotum, déprimée, les joues et le vertex parsemés de petits points pilifères aciculés, les yeux très gros, six fois aussi longs que les tempes, celles-ci très petites, nullement convexes, dirigées presque perpendiculairement à la ligne médiane.

Pronotum cordiforme, d'un quart plus large que long, très

rétréci à la base qui n'est guère plus large que la moitié du bord antérieur. Bord antérieur presque rectiligne ; côtés arrondis en avant, largement sinués en arrière dans le quart basal ; angles postérieurs droits ou obtus, vifs, un peu saillants en dehors ; base saillante, nettement échancrée latéralement entre l'angle postérieur et la partie médiane pédonculaire. Disque déprimé, à ponctuation assez dense, mais superficielle ; la gouttière marginale très étroite et régulière ; le sillon longitudinal médian étroit, superficiel, limité par deux traits parallèles ; la surface basale rugueuse ; les fossettes petites et arrondies, situées près de la base.

Elytres un peu plus larges que le pronotum, un peu plus

Fig. 2.

Perileptus indicus, sp. n., de West Almora.

de deux fois aussi longs que larges, parallèles et déprimés. Angle huméral saillant ; stries très superficielles, mais entières, non effacées aux extrémités ; elles sont marquées par de gros points arrondis et très peu profonds, assez irréguliers. Interstries plans, finement pointillés ; les pores discaux sont bien distincts. Chétotaxie normale.

Cette espèce rappelle beaucoup le *P. madecassus*, Fairm., de Madagascar, mais sa taille est un peu plus grande, son pronotum et ses élytres sont plus déprimés, la base de son pronotum est plus étroite, les stries de ses élytres sont plus superficielles et moins nettement ponctuées.

Perileptus ceylanicus, Nietner. (Fig. 3.)

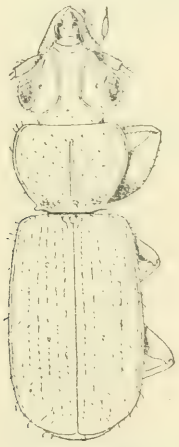
Inde.—Gov. of Bombay : Poonah, mai 1908, un ex. ♀ (*G. Bryant*, in coll. H. E. Andrewes).

L'espèce est décrite de Ceylan. Un co-type se trouve au Musée de Stettin où M. H. E. Andrewes a pu lui comparer l'exemplaire pris à Poonah, que j'ai sous les yeux et qui ne diffère guère de ce co-type que par sa taille un peu plus grande. Voici la description de l'individu indien.

Long. 2·5 mm.

Testacé rougeâtre brillant, avec les élytres un peu rembrunis, mats, les pattes pâles. Téguments non alutacés. Pubescence courte et rare.

Fig. 3.



Perileptus ceylanicus, Nietn., de Poonah.

Tête transverse, à ponctuation aciculée très éparse sur le front et le vertex. Yeux très gros, saillants, cinq fois aussi longs que les tempes ; celles-ci très courtes, planes, presque perpendiculaires à la ligne médiane. Epistome tuberculé. Front convexe entre les sillons frontaux.

Pronotum ample, un peu plus large que la tête et aussi large que la base des élytres, sa plus grande largeur vers le cinquième basal. Il est transverse, de près d'un tiers plus large que long, peu rétréci à la base, qui est aussi large que les deux tiers du sommet. Côtés bien arrondis depuis les angles antérieurs jusqu'à la base, les angles antérieurs effacés, les angles postérieurs petits, presque dentiformes, aigus et

saillants en dehors, précédés d'une très petite sinuosité du bord latéral ; base peu saillante, en courbe régulière d'un angle à l'autre. Disque particulièrement convexe, bombé surtout sur les côtés, sa ponctuation plus dense que sur la tête; gouttière marginale très fine, sillon longitudinal médian limité par deux traits parallèles ; surface basale rugueuse ; fossettes petites et profondes.

Elytres parallèles, déprimés, moins de deux fois aussi longs que larges, mats. Stries superficielles, à ponctuation grosse et irrégulière, mais très peu profonde; ponctuation des interstries assez forte et espacée.

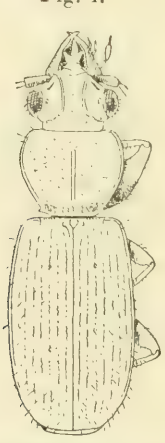
Chétotaxie normale ; les pores discaux sont distincts.

Ce *Perileptus* se fait remarquer surtout par la courbure forte et régulière des côtés de son pronotum.

Perileptus pusillus, sp. n. (Fig. 4.)

Tonkin.—Hoa Binh, dans les monts Sip-song-chau-thai, 10 ex. reçus par M. J. M. Bedoc (*types* in coll. R. Jeannel).

Fig. 4.



Perileptus pusillus, sp. n., de Hoa Binh.

Long. 2·2 à 2·3 mm.

Déprimé, allongé et parallèle. Brun, rougeâtre brillant avec les pièces buccales, le pronotum et le disque des élytres plus clairs, les antennes rembrunies à partir du 3e article, les pattes testacées pâles, les élytres mats avec un reflet bronzé. Pubescence courte et peu fournie. Téguments très brillants, non alutacés.

Antennes atteignant le milieu des élytres, un peu épaissies au sommet. Tête transverse, déprimée, les joues et le vertex couverts de petits points pilifères aciculés très espacés. Yeux très gros, saillants, quatre à cinq fois aussi longs que les tempes ; celles-ci planes et perpendiculaires à la ligne médiane.

Pronotum cordiforme, aussi large que la tête, un peu moins large que les élytres, d'un quart plus large que long, peu rétréci à la base qui est aussi large que les deux tiers du bord antérieur. Côtés arqués comme chez *P. ceylanicus* ; angles postérieurs et base de même forme. Disque très peu convexe, assez densément ponctué ; la gouttière marginale est très fine, le sillon longitudinal s'élargit en arrière et s'efface avant la base ; la surface basale est rugueuse, les fossettes basales sont petites et arrondies.

Elytres oblongs, déprimés, deux fois aussi longs que larges, striés comme chez les espèces précédentes. Pores discaux de la 3e strie distincts.

Ce petit *Perileptus* est certainement très voisin du *P. ceylanicus*, dont il se distingue surtout par la forme moins convexe de son pronotum et le reflet bronzé de ses élytres. Il est probable que lorsque le *P. ceylanicus* sera mieux connu, on sera conduit à lui rattacher le *P. pusillus* comme race géographique. Les deux formes appartiennent peut-être à une même espèce largement répandue dans l'Inde péninsulaire, Ceylan et la péninsule indo-chinoise ; mais ne connaissant pas encore le véritable *P. ceylanicus* de Ceylan et n'ayant vu qu'un seul individu de l'Inde, je ne puis faire autrement que marquer les différences existant entre ce dernier et les *Perileptus* de Hoa Binh.

Perileptus platypterus, sp. n. (Fig. 5.)

Java.—Un exemplaire femelle étiqueté "Tji Salak, Wynknepsbaae, Grelak" (coll. R. Jeannel). Je suppose qu'il doit provenir des monts Salak, au sud-ouest de Buitenzorg.

Long. 2·8 mm.

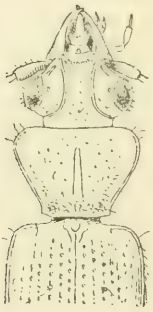
Déprimé, assez large. Rougeâtre brillant uniforme, les antennes et les pattes pâles. Pubescence courte et peu serrée. Téguments non alutacés.

Antennes assez robustes, épaisses, atteignant à peine le quart basal des élytres, les cinq articles apicaux ovalaires et assez larges. Tête transverse, très peu convexe, avec la partie antérieure du front déprimée et plane entre les sillons frontaux. Yeux très saillants, quatre fois aussi longs que les tempes qui sont presque transversalement dirigées et planes.

Ponctuation de la tête très fine et éparse.

Pronotum trapézoïde, mais avec les angles antérieurs un peu moins saillants que chez les espèces suivantes ; la plus grande largeur se mesure au niveau du quart antérieur. Le pronotum est bien transverse, d'un tiers plus large que long, bien rétréci à la base qui est à peine aussi large que les deux tiers du bord antérieur. Côtés arrondis en avant, puis rétrécis presque en ligne droite, sinués vers le sixième basal et parallèles avant les angles postérieurs; ceux-ci droits, presque aigus, vifs et un peu saillants en dehors ; base un peu saillante, arquée régulièrement d'un angle à l'autre, sans échancrure de ses parties latérales. Disque déprimé, à ponctuation assez dense, mais irrégulière et superficielle ; la gouttière marginale étroite, le sillon longitudinal médian assez profond, élargi en arrière ; la surface basale rugueuse et déprimée ; les fossettes profondes, grandes, se prolongeant de chaque côté sur la partie latérale du disque.

Fig. 5.



Perileptus platypterus, sp. n., de Java.

Elytres très déprimés, larges, à peine plus d'une fois et demie aussi longs que larges, donc relativement courts. Epaules bien saillantes, base transverse, côtés bien parallèles comme chez les espèces précédentes. Stries seulement indiquées par des lignes de gros points profonds, assez irréguliers ; les cinq stries internes seules bien marquées, cependant effacées à la base et au sommet ; interstries absolument plans, nettement ponctués.

Chétotaxie normale ; les pores discaux de la 3e strie sont nettement discernables.

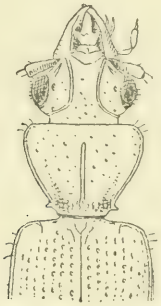
Espèce curieuse par ses caractères synthétiques. Par la forme de son pronotum elle est en effet intermédiaire aux *P. indicus* et *P. imaicus*, constituant deux types morphologiques bien différents ; sa forme très déprimée rappelle un

peu celle du *P. constricticeps*, Sl., d'Australie, et la dépression plane de la région antérieure de son front est comme une ébauche de la structure si particulière du front des *Neoblemus* qui seront décrits plus loin.

Perileptus imaicus, sp. n. (Fig. 6.)

Inde, Himalaya.—Garhwal : Siuni Gad, 1200 m. alt., 1 ex., juin 1920 (*H. G. Champion*).—Dehra Dun : Chakrata, Saiya, 1 ex., avril 1920 (*Dr. M. Cameron*) ; Chakrata, Binal Gad, 3 ex., mai 1922 (*S. N. Chatterjee*).—Kumaon : West Almora, 9 ex. (*types*) (*H. G. Champion*) ; West Almora, Diva, 6 ex., avril et juin 1917, mars et oct. 1918 (*H. G. Champion*) ; West Almora, Upper Gumti Valley, 2 ex., avril 1919 (*H. G. Champion*).—Sikkim : Darjiling, Gopaldhara, 4 ex., nov. 1919 (*H. Stevens*) ; Darjiling, Rongni River,

Fig. 6.



Perileptus imaicus, sp. n., de West Almora.

610 m. d'alt., 1 ex., mars 1920 (*H. Stevens*).—Eastern Duars (*H. Stevens*).

Long. 2·5 à 2·8 mm.

Assez convexe. Rougeâtre brillant, avec la tête plus foncée, la partie apicale et les côtés des élytres noirâtres, la poitrine et l'abdomen brunâtres, les antennes brunes à partir du sommet du 3e article, les pattes testacées. Téguments lisses entre les points, non alutacés. Pubescence rare, mais formée de poils longs, dressés, irréguliers.

Antennes atteignant le milieu des élytres, grêles, les articles apicaux non épaissis. Tête transverse, à ponctuation excessivement fine, très espacée, le front bien convexe entre les sillons. Yeux trois fois aussi longs que les tempes qui sont obliques, mais un peu convexes.

Pronotum trapézoïde, transverse, de plus d'un tiers plus large que long, plus large que la tête, aussi large que la base des élytres; la plus grande largeur se mesure vers le cinquième antérieur, la base est rétrécie, moins large que les deux tiers du bord antérieur. Angles antérieurs saillants en dehors, non effacés; côtés peu arrondis, rétrécis en courbe peu convexe jusqu'au sixième basal, puis brusquement sinués avant les angles postérieurs; ceux-ci aigus, vifs, dentiformes, saillants en dehors; base saillante, avec ses parties latérales échancrées entre l'angle postérieur et le pédoncule. Disque assez convexe, un peu bossu latéralement, sa surface éparsément ponctuée. Gouttière marginale étroite; sillon longitudinal médian profond, limité par deux traits parallèles; surface basale rugueuse; fossettes prolongées en avant par une dépression allongée sur les parties latérales du disque.

Elytres un peu convexes, surtout latéralement, aplatis dans la région suturale; ils sont relativement courts, à peine deux fois aussi longs que larges, subparallèles, un peu élargis après le milieu. Epaules saillantes, mais arrondies; côtés un peu arqués, base transverse. Stries superficielles, mais marquées par des rangées de gros points enfoncés, assez réguliers; les stries externes sont bien visibles, toutes sont un peu effacées à la base et au sommet. Interstries plans, très finement pointillés.

Chétotaxie normale, sauf que les pores discaux de la 3e strie ne sont pas discernables de la ponctuation de la strie.

Espèce très facile à distinguer des autres espèces indiennes par sa coloration rougeâtre très brillante, par sa forme peu déprimée, son pronotum trapézoïde très rétréci à la base, par la forte ponctuation des stries de ses élytres. Elle est représentée dans le Yun-Nan par la suivante.

Perileptus denticollis, sp. n.

Chine méridionale.—Yun-Nan, quatre exemplaires envoyés par des missionnaires à A. Grouvelle, sans autre indication de provenance (coll. R. Jeannel).

Long. 2·8 à 3 mm.

Allongé, assez convexe, subcylindrique. Rougeâtre brillant avec l'apex et la marge des élytres vaguement plus foncés, la poitrine et l'abdomen brunâtres, les antennes rembrunies à partir du 3e article, les pattes testacées. Pubescence rare, formée de poils blanchâtres longs et irréguliers, dressés. Téguments lisses entre les points.

Antennes atteignant le tiers basal des élytres. Tête transverse, à ponctuation aciculée éparse; quelques plis obliques

sur les joues le long des sillons frontaux ; la partie médiane bien convexe entre les sillons. Yeux saillants, quatre fois aussi longs que les tempes qui sont obliques et un peu convexes.

Pronotum relativement très petit, aussi large que la tête et plus étroit que la base des élytres ; sa forme est trapézoïde, comme chez l'espèce précédente, mais un peu moins transverse ; la plus grande largeur se mesure au cinquième antérieur, les angles antérieurs sont saillants, les côtés sont peu arqués, la base est très étroite, par plus large que les deux tiers du bord antérieur. Angles postérieurs dentiformes, aigus, vifs, bien saillants en dehors ; base saillante, avec ses parties latérales échancrées entre l'angle et le pédoncule. Disque convexe, à ponctuation éparse et superficielle ; gouttière marginale, sillon médian, surface basale rugueuse et fossettes comme chez *P. imaicus*.

Élytres oblongs, allongés, plus de deux fois aussi longs que larges, un peu élargis après le milieu. Épaules saillantes et arrondies, côtés un peu arqués. Stries superficielles, toutes visibles, à ponctuation forte, profonde et assez régulière ; interstries convexes, finement pointillés. Pores discaux non discernables de la ponctuation de la 3e strie.

Ce *Perileptus* est voisin du *P. imaicus*, mais il s'en distingue aisément par la petitesse de son pronotum, ses élytres plus longs et plus convexes, sa ponctuation des stries plus forte.

Perileptus cameroni, sp. n. (Fig. 7.)

Inde, Himalaya.—Dehra Dun : Kaligad, 5 ex., juill. 1921 (*Dr. M. Cameron*).

Long. 2·6 mm.

Allongé, convexe. Testacé brillant, les élytres avec une tache brunâtre mal limitée sur la moitié postérieure du disque, les pattes pâles. Téguments lisses et brillants. Pubescence blanchâtre, très fine et très éparse sur la tête et le pronotum, formée sur les élytres par des rangs de poils plus gros, dressés et recourbés en arrière, très régulièrement alignés en séries longitudinales sur chaque interstrie.

Antennes atteignant à peine le tiers basal des élytres, épaisses, les articles apicaux élargis. Tête déprimée, presque lisse, le front convexe entre les sillons, l'épistome uni, sans tubercule. Yeux très gros, cinq à six fois aussi longs que les tempes qui sont planes et obliques, très petites ; cou épais.

Pronotum trapézoïde, convexe, assez grand, plus large que la tête et aussi large que la base des élytres, à peu près aussi long que large. Les angles antérieurs sont bien saillants, la base est très étroite, presque pédonculée, pas plus large que la moitié du bord antérieur. Côtés arqués en courbe régulière depuis les angles antérieurs jusqu'au sixième basal, brusquement sinués à cet endroit, puis presque parallèles en arrière; angles postérieurs presque droits, un peu obtus, vifs, nullement saillants en dehors; base rectiligne. Disque régulièrement convexe, à ponctuation éparse et superficielle; la gouttière marginale très fine, le sillon médian étroit, limité par deux traits parallèles et très rapprochés; base rugueuse,

Fig. 7.

Peryleptus cameroni, sp. n., de Kaligad.

impressionnée transversalement; fossettes arrondies, petites, non prolongées en avant sur le disque.

Élytres ovales et convexes, une fois et demie aussi longs que larges, leur plus grande largeur au milieu; base transverse, épaules effacées, côtés arrondis, sommet atténué. Stries régulières, bien visibles, à ponctuation forte et régulière, un peu effacée à la base. La strie suturale est plus profonde, non parallèle à la suture dont elle s'écarte vers le milieu. Interstries légèrement convexes, presque lisses. Des ailes propres au vol.

Chétotaxie normale; les pores discaux sont très difficiles à distinguer de la ponctuation de la 3e strie.

Cette remarquable petite espèce est bien différente de

toutes les autres espèces du genre. Sa forme convexe, ses téguments lisses et brillants, son pronotum très rétréci à la base et presque pédonculé, ses élytres ovales, à pubescence alignée sur les interstries, sa coloration enfin permettent de la reconnaître au premier coup d'œil. Mais la conformation de sa tête, de ses pièces buccales et de ses pattes indiquent bien qu'elle doit être placée dans le genre *Perileptus*.

Gen. Neoblemus, nov.

Espèce type : *N. championi*, sp. n.

Les espèces de ce genre ont l'aspect général des *Perileptus*, mais sont bien reconnaissables à leur grande taille, à la forme très particulière du vertex et à leurs tibias antérieurs sillonnés sur la face externe.

Long. 4 à 5 mm. Téguments brillants, non réticulés, ponctués et pubescents ; le pronotum glabre chez certaines espèces. Pubescence assez longue et redressée.

Tête très robuste, transverse, déprimés. Yeux velus, plus ou moins gros, convexes. Epistome indistinct ; postépistome soudé avec le front, mais formant une saillie transverse, de forme elliptique, nettement limitée en arrière par un sillon. Sillons frontaux complets, larges et lisses, unis par une large dépression transverse du vertex également lisse et brillante ; les sillons frontaux et leur anastomose médiane forment ainsi sur la tête une dépression lisse en forme d'H, nettement délimitée sur ses bords par un trait qui détoure les joues en dehors, le postépistome en avant, une saillie triangulaire médiane du vertex en arrière. Front ponctué en dehors des sillons, avec de longs poils dressés dont ceux qui se trouvent le long de la partie postérieure des sillons frontaux sont dirigés en dedans et en arrière. Labre et pièces buccales semblables à celles des *Perileptus*. Avant-dernier article des palpes labiaux avec 6 à 8 soies ; languette carrée, à bord libre arqué, convexe. Dent du menton simple, mais largement tronquée.

Pronotum subcordiforme, rétréci à la base, le disque plan, la gouttière marginale large, séparée du disque par une strie, la sillon médian de forme variable, la base rugueuse. Pédoncule mésothoracique très étroit. Ecusson très petit. Elytres parallèles, plans, à épaules anguleuses, la base transverse. Gouttière marginale très étroite, commençant par une petite crosse au niveau de la racine de la 5e strie ; striole juxta-scutellaire nette ; stries fines, superficielles, ponctuées comme les interstries. Pas de côte apicale ni de retour de la strie suturale à l'apex de l'élytre.

Dessous du corps ponctué et pubescent comme la face dorsale. Apophyse prosternale allongée, non rebordée. Métasternum long, trois fois aussi long que le pilier de la hanche postérieure. Des ailes propres au vol.

Pattes grêles et courtes. Les tibias antérieurs assez grêles, avec un sillon longitudinal sur la face externe, s'infléchissant vers le bord interne à la base ; face antérieure du tibia presque glabre, face postéro-externe pubescente. Tibias intermédiaires et postérieurs avec des éperons internes et une frange pectinée bien développée sur le côté externe du bord apical. Tarses courts, les articles 3 et 4 aussi larges que longs, l'article 4 avec une expansion lamelleuse ventrale bien développée, s'étendant sous l'onychium, comme chez les *Perileptus*. Les deux premiers articles du tarse antérieur sont légèrement dilatés et dentés en dedans chez les mâles.

Chétotaxie normale des Trechinæ. Le pore susorbitaire postérieur est perdu chez *N. championi* au milieu d'une houppe de 10 à 12 soies dirigés en dedans. Pores prothoraciques normaux. Série ombiliquée de l'élytre régulière. Premier pore discal placé au quart basal de la 3e strie, deuxième pore un peu après le milieu ; pore apical dans l'axe de la 3e strie.

Organe copulateur mâle petit, semblable à celui des *Perileptus* ; la face ventrale et la partie apicale sont seules chitinisées ; toute la paroi dorsale est membraneuse. Le lobe médian est brusquement coudé à angle droit vers le tiers basal, sa partie apicale est renflée ; les styles sont courts et grêles.

Dans ce nouveau genre se placent trois espèces nouvelles, dont deux, *N. championi* et *N. bedoci*, sont assez voisines et doivent être considérées comme deux espèces géographiques descendant d'une souche commune.

Tableau des Espèces.

1 (2). Yeux bien plus courts que les tempes, celles-ci très bombées. Pronotum pubescent, à gouttière marginale étroite. Sillon externe des tibias antérieurs effacé ..... *andrewesi*, sp. n.

2 (1). Yeux plus longs que les tempes, celles-ci à peine convexes. Pronotum lisse et glabre, à gouttière marginale large. Sillon externe des tibias antérieurs profond.

3 (4). Saillie médiane du vertex lisse et glabre ; tempes planes. Pronotum une fois et quart aussi large que long, ses côtés peu arrondis en avant..... *championi*, sp. n.

4 (3). Saillie médiane du vertex pubescente et pointillée ; tempes un peu convexes. Pronotum presque une fois et demie aussi large que long, ses côtés bien arrondis en avant .... *bedoci*, sp. n.

Neoblemus championi, sp. n.

Inde, Himalaya.—Dehra Dun : Mussoorie, Mossy Falls, un ex., mars 1921 (*Dr. M. Cameron*) ; Dehra Dun, un ex., déc. 1920 (*Dr. M. Cameron*).—Kumaon : West Almora, Diva, un ex., déc. 1917 (*type*) (*H. G. Champion*) ; West Almora, Upper Gumti Valley, un ex., avril 1919 (*H. G. Champion*).—Sikkim : Darjiling, Gopaldhara, un ex., nov. 1919 (*H. Stevens*) ; Darjiling, Namsoo, un ex., nov. 1920 (*H. Stevens*).—Eastern Duars, 3 ex. (*H. Stevens*).

Long. 3·8 à 4·2 mm.

Déprimé, parallèle. Coloration brun rougeâtre brillant, avec les joues, les parties externe, apicale et suturale des élytres, le métasternum et parfois aussi le disque du pronotum brunâtres ; pattes testacées. Tête ponctuée et hérissée de longs poils sur les joues et la saillie de l'épistome, les poils postérieurs des joues formant une longue houppe dirigée en dedans ; saillie discale du vertex glabre et lisse comme les sillons frontaux. Pronotum glabre et lisse. Elytres pubescents, hérissés de poils blanchâtres assez courts, mais très régulièrement espacés.

Tête volumineuse, déprimée, transverse, les yeux très saillants, un peu plus longs que les tempes qui sont obliques, presque planes ; antennes atteignant amplement le milieu des élytres, grêles et cylindriques. Pronotum transverse, une fois et quart aussi large que long, très rétréci à la base qui n'est guère plus large que la moitié du bord antérieur ; celui-ci rectiligne. Côtés peu arqués en avant, sinués brusquement, puis parallèles avant les angles postérieurs qui sont saillants, un peu aigus, vifs ; base légèrement saillante. Gouttière marginale du pronotum très large en avant, cessant en arrière dans la partie basale rétrécie ; disque plan, très brillant, avec un profond sillon longitudinal et médian en coup de gouge, à peine plus large en arrière qu'en avant ; surface basale très rugueuse, fossettes superficielles, ne s'étendant pas en avant, sur le disque. Elytres plans, parallèles, deux fois aussi longs que larges ; les stries régulières, superficielles, mais bien visibles, marquées de lignes de points un peu plus gros que ceux des interstries.

Pattes courtes ; les tibias antérieurs glabres sur leur face antérieure, le sillon de la face externe très profond, bien développé.

Organe copulateur mâle très petit et très peu évolué ; la partie basale est à peine chitinisée. Bord ventral du lobe médian parfaitement rectiligne depuis la coudure basale jusqu'à la pointe, celle-ci mousse, arrondie, peu saillante.

Pas d'armature au sac interne. Styles latéraux courts, terminés par deux soies.

Neoblemus bedoci, sp. n. (Fig. 8.)

Tonkin : Hoa-Binh, dans les monts Sip-song-chau-thai, nombreux exemplaires reçus par M. J. M. Bedoc (*types*).

Long. 4 à 4·5 mm.

Espèce voisine de la précédente, ayant tout à fait le même aspect et la même coloration et en différant par les caractères suivants : La tête est plus robuste, plus transverse, avec les tempes convexes entre le bord postérieur de l'œil et le sillon du cou ; la saillie postérieure du vertex est ponctuée et pubescente comme les joues, tandis qu'elle est lisse et glabre

Fig. 8.

Neoblemus bedoci, sp. n., de Hoa-Binh.

chez *N. championi*. Le pronotum est plus large, plus transverse, presque une fois et demie aussi large que long, ses côtés sont plus arrondis en avant, le sillon longitudinal médian est plus large, surtout en arrière, les fossettes basales plus profondes se prolongent en avant sur les parties latérales du disque. Les élytres sont un peu plus longs, pubescents et striés comme chez *N. championi*, mais les points des stries ne sont pas plus gros que ceux des interstries. Pour le reste, *N. bedoci* présente les mêmes caractères externes que *N. championi*.

L'organe copulateur mâle de *N. bedoci* est un peu différent

de celui de l'espèce indienne ; il est plus grand, la partie apicale du lobe médian est plus renflée dorsalement et sa pointe est plus longue et plus pointue ; les styles latéraux portent trois soies.

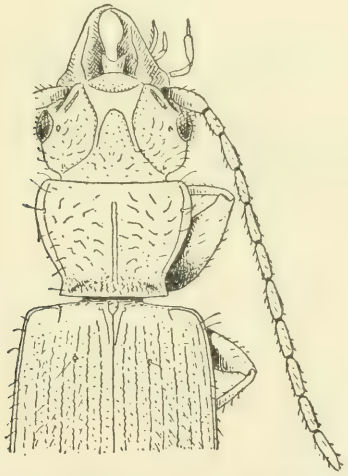
Neoblemus andrewesi, sp. n. (Fig. 9.)

Inde, Himalaya.—Dehra Dun : R. Song, un ex. ♀, févr. 1921 (*type*) (*S. N. Chatterjee*).—Kumaon : Haldwani division, un ex. ♀ (*H. G. Champion*).

Long. 4·6 mm.

Testacé rougeâtre brillant uniforme, avec les pattes pâles. Tête et pronotum pubescents, finement et éparsément

Fig. 9.



Neoblemus andrewesi, sp. n., de Haldwani.

ponctués, les poils des joues dressés, dirigés en dedans sur la partie postérieure près du sillon frontal, ceux du pronotum également dressés, mais dirigés en dedans et en arrière sur le disque ; pubescence des élytres blanchâtre, assez courte, hérissée, un peu dirigée en arrière et régulièrement espacée.

Tête volumineuse, transverse et déprimée, un peu plus large que le pronotum, avec les sillons frontaux lisses et glabres. Les yeux sont saillants, mais relativement très petits ; les tempes sont presque deux fois aussi longues que

les yeux, très convexes, bombées, presque anguleuses. Antennes grêles et cylindriques atteignant amplement le milieu des élytres.

Pronotum transverse, déprimé, d'un tiers plus large que long, très rétréci à la base qui est aussi large que les deux tiers du bord antérieur; celui-ci un peu échancré, presque rectiligne. Côtés peu arrondis en avant, profondément et brusquement sinués à leur sixième basal, puis divergents en arrière, les angles postérieurs aigus, vifs, saillants en dehors, la base presque rectiligne. Disque avec un sillon longitudinal médian superficiel, limité par deux traits parallèles; gouttière marginale relativement étroite, n'atteignant pas la base; surface basale rugueuse, mais moins fortement que chez les deux espèces précédentes; les fossettes profondes, obliques, non prolongées en avant sur les côtés du disque.

Elytres déprimés, parallèles, plus de deux fois aussi longs que larges; les stries nettes, superficielles, sans ponctuation distincte, les interstries assez fortement et densément ponctués.

Pattes courtes et grêles; les tibias antérieurs portent quelques poils sur leur face antérieure et leur sillon externe est peu profond, effacé, mais cependant nettement reconnaissable.

Cette espèce est bien distincte des deux précédentes par la petitesse de ses yeux, ses tempes longues et fortement bombées, son pronotum pubescent à gouttière marginale étroite, son sillon longitudinal externe des tibias antérieurs effacé. Elle constitue dans le genre *Neoblemus* un stade évolutif moins avancé qui rappelle encore les *Perileptus* par certains de ses caractères.

Gen. Trechodes, Blackburn.

Le genre *Trechodes*, que j'ai provisoirement rattaché au groupe des Perileptini (Jeannel, Ann. Soc. ent. Fr. 1921, p. 165) doit devenir le type d'une tribu nouvelle que je me propose de définir ultérieurement lorsque j'aurai à décrire un certain nombre de genres nouveaux des régions australienne, africaine et antarctique, qui s'y rattachent.

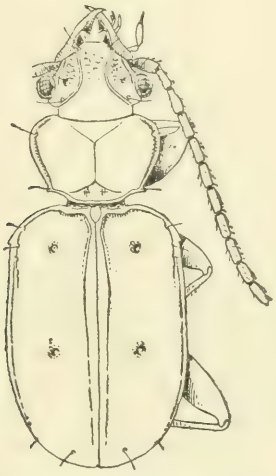
Les *Trechodes* habitent l'Australie (*T. bipartitus*, MacLeay, *T. secalioides*, Blackb.), la Birmanie (*T. cauliops*, Bates), Madagascar et l'Afrique australe et orientale, d'où je connais plusieurs espèces encore inédites. La seule espèce connue de la région orientale est celle de Birmanie.

Trechodes cauliops, Bates. (Fig. 10.)

Trechus cauliops, Bates, 1892, Ann. Mus. Civ. Genova, xxxii. p. 298; type : Karin Ghecù [Mus. Gênes].

Birmanie.—Karin ; Asciuii Ghecù, 1350 m. d'alt., plusieurs exemplaires (*L. Fea*, in Mus. Gênes et coll. R. Jeannel).

Fig. 10.



Trechodes cauliops, Bates, du Karin.

Trib. Trechini, Jeannel.

Gen. Trechus, Clairville.

Je range seulement dans le genre *Trechus* les espèces à série ombiliquée régulière et organe copulateur mâle complet, dont les tibias antérieurs, plus ou moins sillonnés sur la face externe, sont tout à fait glabres et lisses sur la face antérieure, dont les élytres portent une carène apicale, dont la strie suturale se réfléchit à l'apex par une strie récurrente prolongée sur la terminaison de la 5e strie en dedans de la carène apicale et dont la 2e strie forme une crosse apicale, sur la convexité de laquelle se trouve le pore sétigère antéapical.

Ainsi compris, le genre *Trechus* est répandu dans les régions paléarctique, néarctique, orientale et australienne.

Les espèces orientales présentent les mêmes caractères

généraux que les espèces d'Europe. Elles se distinguent cependant par la forme particulièrement ample de leur pronotum et surtout par une conformation un peu spéciale de la base de leur organe copulateur mâle. Il n'existe pas en effet de renflement basal et l'orifice basal, très grand, fait face directement du côté ventral, au lieu que, chez les *Trechus* européens, il est toujours un peu dirigé en arrière à cause de l'inflexion du bulbe basal. De plus, les côtés de l'orifice basal sont toujours profondément échancrés chez les *Trechus* orientaux.

Tableau des Espèces Orientales.

1	(4). Ailés. Yeux gros et saillants, bien plus longs que les tempes. Elytres à base transverse et épaules saillantes.	
2	(3). Pronotum à base aussi large ou plus large que le bord antérieur, les côtés non sinués en arrière. Elytres subparallèles. Long. 4·5 à 5·2 mm.	*indicus*, Putz.
3	(2). Pronotum à base rétrécie, les côtés nettement sinués en arrière. Elytres plus courts, moins parallèles. Long. 4·3 mm.	*championi*, Jeann.
4	(1). Aptères. Yeux petits et peu saillants, à peine plus longs que les tempes. Elytres ovalaires, à épaules effacées.	
5	(10). Angles postérieurs du pronotum obtus mais vifs, la base avec une dépression transverse médiane.	
6	(7). Base du pronotum saillante, ses parties latérales obliques. Long. 3·5 mm.	*cameroni*, sp. n.
7	(6). Base du pronotum rectiligne.	
8	(9). Côtés du pronotum bien arrondis, sinués en arrière. Elytres ovales, à épaules marquées, la plus grande largeur vers le milieu. Long. 4 mm.	*imaicus*, sp. n.
9	(8). Côtés du pronotum peu arqués en arrière, non sinués avant les angles postérieurs. Elytres élargis après le milieu, les épaules très effacées. Long. 2·8 mm.	*pumilio*, sp. n.
10	(5). Angles postérieurs du pronotum tout à fait effacés, les côtés très arrondis, la base non déprimée sur la ligne médiane. Elytres ovales. Long. 3·8 mm.	*bakeri*, sp. n.

Trechus indicus, Putzeys. (Fig. 11.)

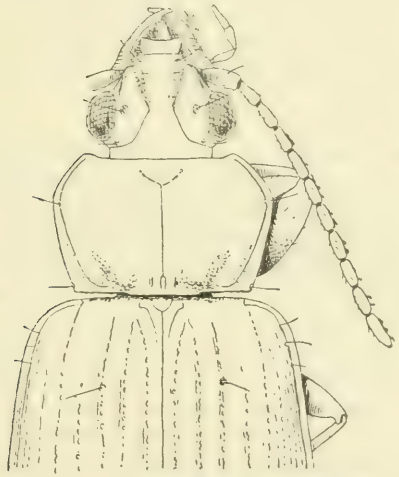
Trechus indicus, Putzeys, 1870, Stett. ent. Ztg. xxxi. p. 175; type : " un mâle des Indes Orientales " (coll. Chaudoir) *.

* Ce type semble malheureusement avoir été perdu. M. R. Oberthür, détenteur actuel de la collection Chaudoir, affirme qu'il n'est pas en sa possession. D'autre part la collection Putzeys, conservée par la Société entomologique de Belgique, ne le renferme pas et il est certain que l'exemplaire de Darjiling, étiqueté " *T. indicus*, type " et conservé au Musée de Stettin n'est pas même un *T. indicus*.

Inde, Himalaya ; Yun-Nan.—Punjab, Simla Hills Staate : Kotgarh, 2150 m. alt., un ex. ♀, sept. 1921 (*Dr. M. Cameron*).—Dehra Dun : Chakrata distr., Konain, 2500 m. alt., Sijla Gad, 1500 m. alt., Kanasar, 2100 m. alt., Khedar Khud, 2200 m. alt., mai 1922, plus. ex. (*S. N. Chatterjee*) ; Chakrata distr., Korawa Khud, 2800 m. alt., mai 1922, un ex. (*Dr. M. Cameron*) ; Mussoorie distr., Dhobi Ghat et Ringal Gad, 2 ex., avril 1922 (*Dr. M. Cameron*) ; Siwalik Hills, Mohan Rau, 1 ex., mars 1922 (*Dr. M. Cameron*).— Sikkim : Kurseong, à 30 km. au sud de Darjiling, un ex. ♂ (coll. R. Jeannel).

Chine : Yun-Nan, un ex. ♂ (coll. R. Jeannel).

Fig. 11.



Trechus indicus, Putz., du Yun-Nan.

M. H. E. Andrewes (Trans. ent. Soc. London, 1922, p. 247) a vu au Musée de Stettin un *Trechus* étiqueté " *T. indicus*, type " et provenant de Darjiling, auquel il a pu comparer un exemplaire de sa propre collection venant de Kurseong. Il a constaté avec raison que le *Trechus* de Stettin ne pouvait pas être le type de Putzeys *, mais il a pu bien marquer les différences existant entre ce *Trechus* de Stettin et l'exemplaire de Kurseong d'une part et le *T. championi* d'autre part. La lecture de sa note m'avait donné à penser que les deux premiers ne pouvaient pas être

* D'après Putzeys, le type du *T. indicus* a les palpes brisés ; or l'exemplaire de Stettin les a au complet.

des *T. indicus* comme M. H. E. Andrewes semblait le croire, mais qu'ils devaient appartenir à une espèce nouvelle du sous-genre *Agonotrechus* décrit plus loin. L'examen de l'exemplaire de Kurseong, que M. H. E. Andrewes a bien voulu me communiquer, m'en a donné la confirmation.

Il ressort en effet de la diagnose de Putzeys que le *T. indicus* appartient bien au groupe des *Trechus*, s. str. La dent du menton est bifide et le deuxième pore discal présent sur la 3e strie. De plus, Putzeys indique nettement que chez *T. indicus* le pronotum est très large et que la strie récurrente apicale des élytres a la conformation caractéristique de celle du *T. championi*. Or, tous ces caractères ne se retrouvent pas chez les deux exemplaires dont parle M. H. E. Andrewes.

Par contre, j'ai sous les yeux toute une série d'exemplaires (dont l'un provient aussi de Kurseong), qui sont parfaitement conformes à la description de Putzeys et doivent être tenus pour des véritables *T. indicus*. En voici la description :

Long. 4·5 à 5·2 mm.

Ailé. Peu convexe, allongé. Noir ou brun de poix, avec la marge du pronotum et celle des élytres plus pâle, les antennes et les pièces buccales ainsi que les pattes testacées ou rougeâtres. La pigmentation est parfois bien développée, mais il semble que la majorité des exemplaires soit plus ou moins dépigmentés, rougeâtres ou brunâtres. Téguments glabres, la tête alutacée.

Tête un peu plus large que longue, à sillons frontaux profonds, anguleux et rapprochés l'un de l'autre sur le disque. Yeux très grands, plus ou moins saillants, parfois très convexes, de quatre à cinq fois aussi longs que les tempes, qui sont très petites. Antennes assez courtes, atteignant à peine le quart basal des élytres, l'article 2 un peu plus court que le 3, lui-même aussi long que le 4, les articles apicaux ovales, courts et épais, une fois et demie aussi longs que larges, le dernier article plus long que l'avant-dernier. Dent du menton grande, large, bilobée.

Pronotum plus large que la tête, très transverse, avec la base aussi large ou plus large que le bord antérieur. Côtés faiblement arrondis en avant, régulièrement arqués dans toute leur longueur et à peine redressés immédiatement avant les angles postérieurs ; ceux-ci presque droits, vifs ; base droite, mais avec la partie médiane nettement lobée sur le pédoncule mésothoracique. Disque modérément convexe, la gouttière marginale large, explanée, agrandie

en arrière, réfléchie en avant sur les angles antérieurs ; sillon médian profond ; dépression basale transverse profonde, avec des gros plis sur le milieu ; fossettes larges, en forme de croissant à concavité antérieure.

Elytres oblongs, convexes, subparallèles, presque deux fois aussi longs que larges, faiblement élargis après le milieu ; base transverse ; épaules saillantes ; côtés peu arqués. Gouttière marginale très large et égale ; toutes les stries distinctes et nettement ponctuées, les quatre premières plus fortes ; interstries internes convexes. La strie récurrente apicale est droite, longue et se termine brusquement par un petit crochet avant d'atteindre le sommet de la 5e strie.

Œdeagus épais, plus ou moins grand ; sa taille varie de près du simple au double. Il est très peu arqué, sans bulbe basal ; les côtés de l'orifice basal sont profondément échancrés et il n'existe pas à la base d'aileron sagittal. La partie apicale est peu à peu atténuée et se termine par une sorte de bec épais, mousse, recourbé en crochet du côté ventral. Styles latéraux très grêles. Sac interne avec deux lames chitineuses dont l'une, dorsale, est la plus grande, longue et étroite.

Chétotaxie.—Lignes orbitaires convergentes en avant. Pores prothoraciques normaux ; premier pore discal placé vers le quart basal de la 3e strie, deuxième pore un peu après le milieu. Pore antéapical un peu plus rapproché de la suture que du bord apical.

L'espèce est assez variable. En général, les mâles sont bien plus grands que les femelles et leurs yeux sont plus convexes. La grandeur des élytres est aussi variable. Les deux exemplaires du Punjab et du Sikkim que j'ai sous les yeux les ont notablement plus courts que ceux du Dehra Dun et du Yün-Nan. D'autre part, l'exemplaire de cette dernière localité a un pronotum un peu plus large, dont les côtés sont un peu anguleux au lieu d'être régulièrement arqués. Mais il ne s'agit certainement pas là d'une différence spécifique. L'œdeagus est tout à fait semblable chez cet exemplaire chinois à celui des individus indiens.

Je n'ai pas vu de *T. indicus* de West Almora, quoique de nombreux matériaux de cette partie du Kumaon m'aient été communiqués. Il semble donc que dans ce district montagneux le *T. indicus* soit remplacé par le *T. championi*.

Trechus championi, Jeannel. (Fig. 12.)

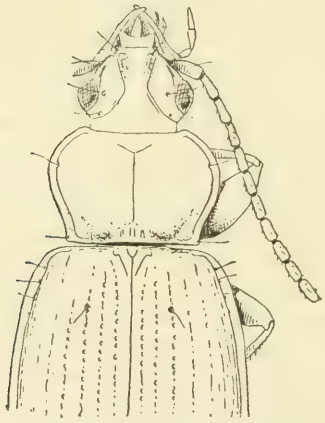
Trechus championi, Jeannel, 1920, Ann. & Mag. Nat. Hist. sér. 9, vol. v. p. 109 ; type : Nainital (Brit. Museum).

Inde, Himalaya.—Kumaon : Nainital, 8 ex., sept. 1918 (*types*) (*H. G. Champion*) ; West Almora, Diva, 2 ex., oct. 1918 (*H. G. Champion*).—Sikkim : Darjiling, 2 ex. (*J. Harmand*, in Mus. Paris) ; Darjiling, Gopaldhara, 2000 m. alt., 3 ex., avril 1914 (*H. Stevens*).

Je ne connaissais pas le *T. indicus* lorsque j'ai décrit ce *Trechus* ; je puis donc maintenant ajouter à sa diagnose les quelques caractères différentiels suivants.

Chez *T. championi* la coloration est toujours plus foncée, toujours d'un noir très brillant et un peu irisé. Les yeux

Fig. 12.



Trechus championi, Jeann., de Nainital.

sont plus petits que chez *T. indicus*, la base du pronotum est un peu moins large que le bord antérieur et les côtés sont plus fortement arrondis en avant, sinués dans leur partie postérieure ; le disque du pronotum et les élytres sont plus convexes ; les élytres sont plus courts, moins parallèles.

L'œdeagus est semblable dans les deux formes, sauf que chez *T. championi* il existe un aileron sagittal sur la base du lobe médian et que les lames du sac interne paraissent un peu plus courtes et plus larges.

En somme, ces deux *Trechus* sont très voisins ; mais on ne doit pas considérer le *T. championi* comme une race géographique du *T. indicus*, car dans le Sikkim les deux formes coexistent autour de Darjiling.

Trechus imaicus, sp. n. (Fig. 13.)

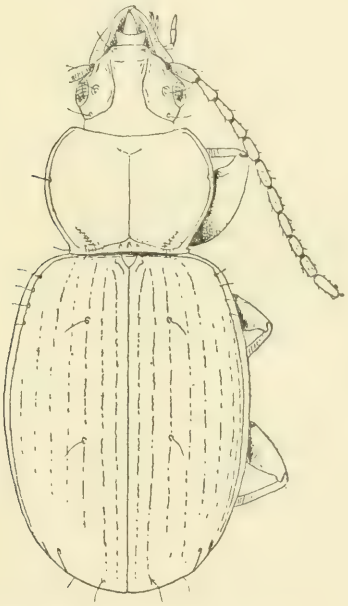
Inde, Himalaya.—Sikkim : Tonglu, sur la frontière du Nepal, 3050 m. alt., un ex. ♂, sept. 1920 (*H. Stevens*).

Type in coll. H. E. Andrewes.

Long. 4 mm.

Aptère. Elliptique, peu convexe, glabre. Brun de poix brillant, avec les pièces buccales, le labre et l'épistome, les antennes, les pattes, les épipleures, une fine ligne médiane sur le pronotum, la marge et la suture des élytres rougeâtres. Tête alutacée.

Fig. 13.



Trechus imaicus, sp. n., de Tonglu.

Tête petite, ovalaire, à peine plus large que la moitié du pronotum ; sillons frontaux réguliers, arrondis, non anguleux sur le vertex. Yeux très peu convexes, un peu plus longs que les tempes, qui sont convexes. Antennes grêles, atteignant à peine le tiers basal des élytres, l'article 2 plus court que le 3, aussi long que le 4, les articles apicaux ovalaires, allongés, le dernier un peu plus long que l'avant-dernier.

Pronotum ample et transverse, d'un tiers plus large que long, aussi large que les deux tiers des élytres à leur plus grande largeur, la base aussi large que le sommet ; la plus grande largeur vers le tiers antérieur. Angles antérieurs effacés ; côtés largement et régulièrement arrondis, à peine redressés immédiatement avant les angles postérieurs ; ceux-ci obtus, vifs, non saillants ; base rectiligne. Disque régulièrement convexe, lisse ; gouttière marginale très étroite ; fossettes basales lisses, transverses, en forme de dépressions courbes à concavité antérieure ; dépression basale sans rugosités ; un sillon longitudinal bien marqué.

Elytres ovales, assez convexes, le bord basal oblique par rapport au pédoncule, les épaules effacées, arrondies, les côtés bien arqués ; gouttière marginale large et égale. Stries toutes visibles, mais fines, superficielles, irrégulières, lisses ; la 2e strie forme une crosse apicale très allongée ; strie récurrente se terminant en avant brusquement avant d'atteindre la 5e strie.

Pattes robustes, les fémurs renflés, surtout les antérieurs. Tibias antérieurs à angle apical externe tronqué, le sillon longitudinal externe superficiel.

Œdeagus assez court, arqué, la base non renflée, avec une profonde échancrure latérale de son bord basal ; l'apex graduellement rétréci, terminé par un bec effilé et légèrement retroussé. Sac interne armé d'écailles et de petits épines dans sa partie apicale évaginable. Styles latéraux larges, avec 4 soies.

Chétotaxie.—Lignes orbitaires convergentes en avant ; le premier pore est fovéolé. Pore prothoracique antérieur placé vers le milieu, le pore postérieur sur l'angle postérieur. Premier pore discal au tiers basal de la 3e strie, deuxième pore un peu après le milieu ; pore antéapical relativement loin de l'apex.

Trechus cameroni, sp. n. (Fig. 14.)

Inde, Himalaya.—Punjab, Simla Hill States : Kotgarh, 2150 m. alt., sept. 1921, 1 ex. (*S. N. Chatterjee*) ; Narkanda, 2800 m. alt., un ex. ♂, sept. 1921 (*type*) (*Dr. M. Cameron*).

Long. 3·5 mm.

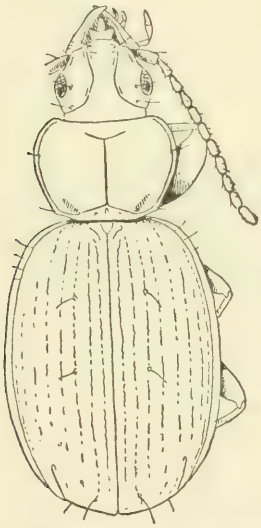
Aptère. Ovalaire et glabre, ayant vaguement l'aspect d'un petit *T. obtusus*, Er., aptère, mais plus fortement strié. Brun de poix brillant, avec les épipleures, la marge du pronotum, la marge et la suture des élytres, les antennes, les pièces buccales et les pattes rougeâtres. Tête alutacée.

Tête petite, allongée, avec les sillons frontaux arrondis, à

peine anguleux sur le vertex; les yeux très peu saillants, guère plus longs que les tempes; celles-ci nullement convexes. Antennes dépassant à peine la base des élytres, leur article 2 aussi long que le 3, nettement plus long que le 4, les articles apicaux (7–10) ovales et courts, à peine une fois et demie aussi longs que larges, le dernier un peu plus long que l'avant-dernier.

Pronotum assez ample, transverse, d'un tiers plus large que la tête, un peu moins large que les deux tiers des élytres, d'un tiers plus large que long, sa plus grande largeur vers le tiers antérieur, sa base un peu plus étroite que le bord

Fig. 14.



Trechus cameroni, sp. n., de Simla Hills.

antérieur. Côtés assez fortement arrondis en avant, nullement sinués dans leur partie postérieure; angles postérieurs très obtus, émoussés, non saillants; base très saillante, avec les parties latérales obliques. Disque régulièrement convexe; gouttière marginale large et régulière; sillon longitudinal médian net; dépression basale profonde, nette, avec des plis sur la ligne médiane; fossettes profondes, lisses, en forme de croissant à concavité antérieure.

Elytres ovales, régulièrement convexes, une fois et demie aussi longs que larges, avec leur plus grande largeur au

milieu ; gouttière marginale large et régulière, égale. Base non transverse ; épaules un peu saillantes, mais très arrondies ; côtés bien arqués, sommet arrondi. Stries indistinctement ponctuées, les deux premières profondes, les stries 3–5 progressivement plus superficielles, les stries 6–8 tout à fait effacées ; les trois premiers interstries assez convexes. Crosse apicale de la 2e strie à peine indiquée ; strie récurrente apicale longue, droite, se terminant brusquement en avant par un petit crochet.

Pattes robustes, les fémurs renflés ; sillon longitudinal externe des tibias antérieurs un peu effacé.

Œdeagus assez grêle, allongé, peu arqué ; pas de bulbe basal ; les côtés de l'orifice basal sont profondément échancrés, comme chez les espèces précédentes. Pas d'aileron basal. Sommet effilé en une longue pointe subcylindrique, grêle et occupant presque le tiers de la longueur totale de l'œdeagus ; son extrémité est recourbée en crochet du côté ventral. Pièce évaginable du sac interne assez courte et large.

Chétotaxie.—Lignes orbitaires parallèles. Premier pore discal placé au tiers basal de la 3e strie, deuxième pore vers le milieu, mais situé sur le 3e interstrie. Pore antéapical plus rapproché de la suture que du bord apical.

Cette petite espèce ressemble assez à la précédente, mais elle est plus petite et se reconnait au premier coup d'œil à son pronotum dont les côtés sont bien moins arrondis et dont la base est nettement saillante. De plus ses caractères sexuels sont très particuliers.

Trechus pumilio, sp. n. (Fig. 15.)

Inde, Himalaya.—Kumaon : West Almora Division, Pindar, 3350 m. d'alt., un ex. ♀, juill. 1920 (*type*) (*H. G. Champion*).

Long. 2·8 mm.

Aptère. Peu convexe, rétréci en avant. Glabre. Brun de poix brillant, avec la marge des élytres rougeâtre, les antennes, les pièces buccales et les pattes testacées. Tête alutacée, le reste du corps lisse.

Tête petite, arrondie, à peu près aussi large que les trois quarts de la largeur du pronotum, les sillons frontaux arrondis, non anguleux, mais approfondis sur le vertex. Yeux très peu saillants, un peu plus longs que les tempes, celles-ci un peu convexes. Antennes courtes, atteignant à peu près le quart basal des élytres, l'article 2 plus court que le 3, aussi long que le 4, les articles apicaux ovales, courts,

le 9 une fois et demie aussi long que large, le dernier un peu plus long que le précédent.

Pronotum transverse, de moitié plus large que long, aussi large que les deux tiers des élytres, la base rétrécie, un peu plus étroite que le sommet, la plus grande largeur vers le tiers antérieur. Angles antérieurs arrondis, mais saillants en avant; côtés fortement arrondis en avant, redressés avant les angles postérieurs ; ceux-ci obtus, émoussés, non saillants ; base saillante, avec les parties latérales obliques. Disque peu convexe, le sillon médian net et profond ; gouttière marginale large, élargie en arrière ; dépression basale nette, courte, plissée ; fossettes petites et peu profondes, lisses.

Fig. 15.

Trechus pumilio, sp. n., de West Almora.

Elytres une fois et demie aussi longs que larges, leur plus grande largeur après le milieu, leur surface peu convexe. Base étroite et oblique ; épaules très arrondies et effacées ; côtés bien arqués. Gouttière marginale large et égale. Toutes les stries visibles, fines, vaguement et superficiellement ponctuées, les stries externes un peu effacées. Strie récurrente apicale se terminant brusquement en avant, avant d'atteindre la 5e strie.

Pattes courtes, avec les fémurs très renflés. Tibias antérieurs courts et épais, avec l'angle apical externe arrondi, le sillon longitudinal externe superficiel.

Chétotaxie.—Lignes orbitaires presque parallèles, un peu

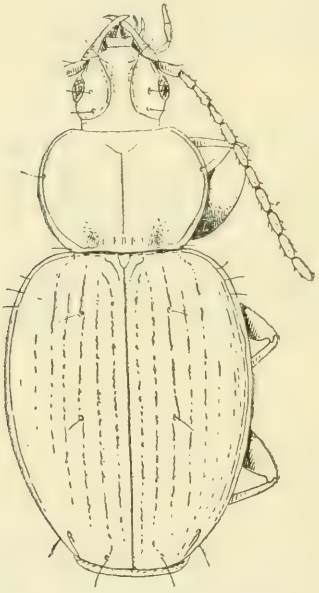
convergentes en avant. Premier pore prothoracique au tiers antérieur ; deuxième pore sur l'angle postérieur. Premier pore discal de l'élytre un peu avant le tiers basal, deuxième un peu après le milieu. Pore antéapical à égale distance de l'apex et du bord sutural.

Cette petite espèce a un peu l'aspect du *T. obtusiusculus*, Ganglb., de Bosnie, mais elle est notablement plus petite, son pronotum est plus ample, plus large en avant et ses élytres sont plus fortement striés.

Trechus bakeri, sp. n. (Fig. 16.)

Iles Philippines.—Luzon : Benguet prov., Baguio, un ex. ♂ (*C. F. Baker*) (*type* in coll. H. E. Andrewes).

Fig. 16.



Trechus bakeri, sp. n., de Luzon.

Long. 3·8 mm.

Aptère. Ovalaire, convexe. Glabre. Noir de poix, avec les antennes, les pièces buccales et les pattes rougeâtres. Tête alutacée, le reste du corps lisse.

Tête très petite, arrondie, à peine large comme la moitié de la largeur du pronotum, les sillons frontaux nets, arrondis, non anguleux. Yeux nullement saillants, petits, à peu

près aussi longs que les tempes qui sont peu convexes. Dent du menton large et languette saillante, comme chez les espèces indiennes. Antennes fines et courtes, ne dépassant pas le cinquième basal des élytres, l'article 2 un peu plus court que le 3 et aussi long que le 4, les articles apicaux ovalaires, deux fois aussi longs que larges, le dernier plus long que l'avant-dernier.

Pronotum ample, convexe, arrondi, transverse, de plus d'un tiers aussi large que long, aussi large que les deux tiers des élytres et présentant sa plus grande largeur vers le milieu ; la base un peu plus large que le sommet. Côtés régulièrement et fortement arrondis d'un angle à l'autre ; angles postérieurs effacés, très obtus ; base légèrement bisinuée, presque droite. Disque convexe, à ligne médiane nette ; gouttière marginale étroite, mais élargie sur les angles postérieurs ; base un peu rugueuse, non déprimée sur la ligne médiane ; fossettes formant sur les côtés de la base une dépression en croissant, peu profonde, à concavité tournée en avant.

Elytres ovoïdes, atténués en arrière, à peu près une fois et demie aussi longs que larges, la plus grande largeur vers le milieu, la surface très convexe. Base transverse ; épaules arrondies, effacées ; côtés bien arqués. Stries nettes, lisses, toutes visibles, les externes un peu plus superficielles, les interstries internes un peu convexes. Gouttière marginale large ; strie récurrente apicale droite et se terminant brusquement en avant, comme chez les espèces indiennes.

Pattes robustes, à fémurs renflés. Les tibias antérieurs subdroits, épaissis au sommet, la gouttière longitudinale externe profonde. Tarses antérieurs mâles avec les deux premiers articles bien dilatés.

Œdeagus grêle, long, peu arqué, la base peu renflée, avec les bords latéraux de l'orifice basal profondément échancrés ; un petit aileron basal. Sommet effilé en pointe longue et mousse, droite, avec le bord ventral un peu anguleux. Styles latéraux très grêles, terminés par 2 soies. Sac interne sans armature bien différenciée, ses parois seulement vaguement chitinisées dans la partie apicale.

Chétotaxie.—Lignes orbitaires parallèles. Pores prothoraciques en position normale. Premier pore discal vers le quart basal de la 3e strie, deuxième pore après le milieu. Pore antéapical plus rapproché du bord apical que de la suture.

Cette espèce est à coup sûr étroitement apparentée aux espèces himalayennes ; son organe copulateur mâle, en particulier, est tout à fait du même type. Elle est toutefois

très facile à reconnaître à la forme très spéciale, large et arrondie de son pronotum.

Gen. Agonotrechus, nov.

Espèce type : *Trechus birmanicus*, Bates.

Les espèces de ce genre ont l'aspect des *Trechus* ; elles ressemblent un peu au *T. championi*, Jeann., de l'Himalaya. Elles se reconnaissent cependant au premier abord à leur labre non échancré, leurs antennes longues et cylindriques, leur pronotum subcarré, l'absence du deuxième pore sétigère de la 3e strie des élytres. Les tibias antérieurs sont droits, sillonnés en dehors et pourvus de quelques poils très petits sur la partie apicale de leur face antérieure.

Taille moyenne. Glabre. Forme générale large et robuste, le pronotum relativement petit. Deux pores susorbitaires ; pore prothoracique antérieur placé vers le tiers antérieur, deuxième pore avant l'angle postérieur. Série ombiliquée régulière. Premier pore discal très rapproché de la base, vers le sixième basal de la 3e strie ; pas de deuxième pore sur la 3e strie. Pore antéapical près de l'apex, en position normale sur la crosse de la 2e strie.

Tête petite, arrondie, les sillons frontaux allongés, non anguleux, mais plutôt parallèles sur le vertex. Yeux très grands et très peu saillants, les tempes planes. Antennes longues, à articles apicaux longs et cylindriques, bien différents en cela des articles ovalaires des *Trechus*. Labre transverse, subrectangulaire, le bord libre non échancré, un peu bisinué. Labium soudé, sans trace de suture ; la dent du menton simple. Languette subcarrée à bord libre arrondi, les paraglosses larges. Palpes maxillaires grêles, à dernier article plus long que l'avant-dernier.

Pronotum petit, subcarré, avec la base lisse, les parties latérales de la base formant une large surface lisse concave, les angles postérieurs explanés et relevés.

Elytres amples, convexes, ovoïdes. La gouttière humérale commence à la racine de la 5e strie ; striole juxtascutellaire bien développée. Stries profondes, régulières, entières ; strie récurrente apicale courte et profonde, atténuée peu à peu en avant pour se continuer sans interruption avec le sommet de la 5e strie.

Pattes robustes ; tibias antérieurs droits, assez longs, avec un profond sillon longitudinal externe ; la partie apicale de la face antérieure rugueuse, garnie de quelques poils très petits. Tarses antérieurs mâles avec les deux premiers articles dilatés et dentés en dedans.

Organe copulateur mâle du même type que celui des *Duvalites*. La base est recourbée du côté ventral, un peu renflée; le sommet est asymétrique et forme une pointe large et mousse, un peu infléchie du côté ventral. Styles avec 3 soies terminales. Sac interne avec une pièce évaginable en forme de gouttière placée de champ.

A cause de la structure de leurs tibias antérieurs, les *Agonotrechus* se placent auprès des *Duvalites*; mais ils s'écartent nettement des espèces oculées de ce genre par leur dent du menton simple, leur labium soudé, la forme du labre et les caractères chétotaxiques. Il est remarquable qu'un autre petit genre d'Europe doive être rapproché des *Agonotrechus*, c'est *Iberotrechus*, Jeann., des monts Cantabriques, chez lequel on retrouve les mêmes conformations du labre, du labium et de la dent du menton. De telles affinités entre des formes séparées par de telles distances géographiques indiquent bien qu'on est là en présence de survivants de vieilles lignées contemporaines des ancêtres oculés des *Duvalites* actuels.

Le genre *Agonotrechus* ne renferme que deux espèces, toutes deux de la région orientale.

Agonotrechus birmanicus, Bates.

Trechus birmanicus, Bates, 1892, Ann. Mus. Civ. Genova, xxxii. p. 297; type: Asciuii Ghecù [Mus. Gênes].

Birmanie. — Karin: Asciuii Ghecù, alt. 1500 m. env. (*L. Fea*, in Mus. Gênes et coll. R. Jeannel).

Long. 5 mm.

Large et convexe. Ailé. Noir de poix, avec les élytres à reflets irisés, la marge du pronotum et des élytres rougeâtres, les antennes testacées rougeâtres, les pattes testacées. Téguments lisses.

Tête ovalaire, à peu près aussi large que le pronotum, les yeux quatre à cinq fois aussi longs que les tempes; celles-ci obliques, mal limitées en arrière. Antennes atteignant le tiers basal des élytres, l'article 2 un peu plus court que le 4, les articles apicaux (7–10) environ quatre fois aussi longs que larges, cylindriques, le dernier un peu plus long que l'avant-dernier.

Pronotum très petit, subcarré, à peine d'un tiers plus large que long, plus étroit qu'un seul élytre, la base aussi large que le sommet. Côtés peu arrondis, nettement sinués en arrière; angles postérieurs droits, vifs, fortement relevés; base rectiligne. Disque très peu convexe, avec les deux côtés de la partie basale largement déprimés en deux vastes

surfaces concaves et lisses; gouttière marginale large, se perdant en arrière dans les vastes surfaces concaves; sillon longitudinal médian net, atteignant la base et le sommet.

Élytres amples et très convexes, atténués en arrière; la base transverse, les épaules arrondies mais saillantes, les côtés bien arqués. Gouttière marginale large et égale, seulement rétrécie aux épaules. Stries toutes bien visibles, assez fines, régulièrement ponctuées, les stries externes aussi profondes que les stries internes; interstries peu convexes.

Œdeagus petit, grêle, non atténué au sommet; la partie basale modérément arquée du côté ventral, le bec large, mousse, asymétrique, à peine recourbé du côté ventral.

Chétotaxie.—Lignes orbitaires convergentes en avant. Pore antéapical un peu plus rapproché de la suture que du bord apical, placé sur la crosse de la 2e strie qui est courte et bien développée.

Agonotrechus andrewesi, sp. n. (Fig. 17.)

Inde, Himalaya.—Sikkim: Kurseong, à 30 km. au sud de Darjiling, un ex. ♂ (*type*) (coll. H. E. Andrewes); Darjiling, un ex. ♂ (ex Putzeys, in Mus. Stettin).

J'ai sous les yeux l'exemplaire de Kurseong que M. H. E. Andrewes a bien voulu me communiquer après l'avoir comparé à celui qui est conservé au Musée de Stettin (H. E. Andrewes, Trans. Ent. Soc. London, 1922, p. 247). J'ai pu vérifier ainsi qu'il s'agit non pas du *Trechus indicus*, Putz. (voir plus haut, p. 418), mais bien d'une espèce nouvelle voisine de l'*Agonotrechus birmanicus*, Bates.

Long. 5 mm.

Même forme générale que chez *A. birmanicus*; coloration noir brillant, un peu irisé, avec la marge des élytres, les antennes et les pattes rougeâtres. Téguments lisses.

Tête très petite, ovalaire, pas plus large que les deux tiers du pronotum; les yeux quatre à cinq fois aussi longs que les tempes; celles-ci obliques. Antennes grêles, atteignant le tiers basal des élytres, semblables à celles de l'*A. birmanicus*.

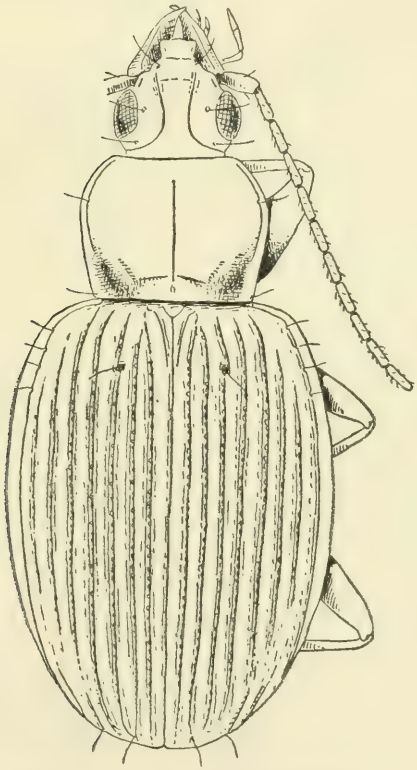
Pronotum plus grand que chez *A. birmanicus*, aussi large qu'un élytre dans sa plus grande largeur, transverse, d'un tiers plus large que long, la base nettement plus large que le bord antérieur. Côtés bien moins arqués en avant que chez *A. birmanicus*, nullement sinués en arrière; les angles postérieurs obtus, émoussés, la base rectiligne. Disque très peu convexe, sa partie basale conformée comme chez *A. birmanicus*; gouttière marginale large, effacée en arrière.

Elytres amples et très convexes, semblables à ceux de l'*A. birmanicus*, mais avec les stries plus profondes et les interstries plus convexes.

Œdeagus plus arqué du côté ventral que chez *A. birmanicus*, le bec large et mousse, fortement asymétrique, nettement recourbé du côté ventral.

Mêmes caractères chétotaxiques que chez *A. birmanicus*.

Fig. 17.



Agonotrechus andrewesi, sp. n., de Kurseong.

A. andrewesi diffère donc de l'espèce birmane par la petitesse de sa tête, son pronotum plus grand, à côtés moins arqués en avant, nullement sinués en arrière, à base bien plus large et à angles postérieurs émoussés et obtus, par la striation plus forte de ses élytres et aussi par de légères différences dans la forme de l'organe copulateur mâle.

Gen. Stevensius, nov.

Espèce type : *Stevensius lampros*, sp. n.

Ce genre est voisin de *Duvalites*, Jeann., et semble bien le remplacer dans les régions alpines de l'Himalaya. Comme chez les *Duvalites* oculés de l'Europe, les tibias antérieurs chez *Stevensius* sont droits, sillonnés sur leur face externe et ont la partie apicale de leur face antérieure rugueuse et pubescente. Mais le genre nouveau de l'Himalaya se distingue par un facies très particulier, une forme spéciale de l'épistome et du vertex et par d'importants caractères chétotaxiques.

Aptère. Forme générale large, avec la tête volumineuse, le pronotum rétréci et les élytres suborbiculaires, presque lisses et brillants. Sillons frontaux complets, profonds, les joues et le vertex très convexes ; le vertex forme une saillie médiane allongée, arrondie en avant et bien séparée à ce niveau de l'épistome qui est très déprimé, tout à fait plan, subrectangulaire et très transverse. Yeux petits, arrondis et saillants ; tempes très grandes et très bombées. Antennes à articles apicaux ovalaires.

Labre transverse, à bord antérieur échancré et cilié. Mandibules longues et acérées, recourbées. Palpes maxillaires à avant-dernier article conique, très étroit à la base, élargi au sommet, le dernier article épais, subconique, aussi épais mais plus long que l'avant-dernier. Labium soudé au submentum, sans trace de suture ; la dent médiane bifide et profondément incisée. Languette très saillante, son bord libre anguleux, formant une saillie conique qui porte deux grandes soies médianes et deux ou trois plus petites de chaque côté.

Pronotum subcordiforme, à base étroite ; ses côtés rebordés et son disque convexe. Surface basale déprimée, avec de profondes fossettes latérales.

Elytres très larges, régulièrement convexes ; le bord basal est très oblique et relativement long. Gouttière marginale large et régulière ; en avant des épaules, elle se rétrécit peu à peu le long du bord basal pour se perdre sur la racine de l'élytre, sans petit crochet à son origine. Les traces de la 5^{e} strie paraissent bien s'infléchir à la base vers la racine de l'élytre de façon que l'origine de la gouttière marginale semble bien correspondre à la base de la 5^{e} strie, comme chez les *Duvalites*. Disque des élytres presque lisse, très brillant, avec de vagues traces des stries à peine discernables.

Pattes courtes. Tibias antérieurs droits, avec un profond sillon longitudinal sur la face externe, la partie apicale de la

face antérieure rugueuse, ponctuée, garnie de quelques petits poils très courts. Tarses relativement courts et épais, les tarses antérieurs avec les deux premiers articles dilatés en dedans chez les mâles.

Œdeagus du même type que celui des *Duvalites* européens. Le bulbe basal est bien développé et infléchi du côté ventral, les styles latéraux sont larges et terminés par 4 soies, le sac interne est armé de pièces apicales allongées, plus ou moins en forme de valves.

Chétotaxie.—Deux pores susorbitaires ; pores prothoraciques bien développés. Série ombiliquée régulière semblable à celle des *Duvalites*. Un seul pore discal vers le milieu de l'élytre ; le deuxième pore et le pore antéapical manquent. A l'apex se trouvent deux petits pores apicaux, l'un près de la carène apical, à la base de la strie récurrente, l'autre sur le bord apical.

Comme on le voit, le *Stevensius* présente les mêmes caractères chétotaxiques que les *Agonotrechus*, qui d'ailleurs, malgré un tout autre aspect extérieur, appartiennent au même groupe et constituent une lignée certainement issue de la même souche.

Stevensius lampros, sp. n. (Fig. 18.)

Inde, Himalaya.—Sikkim : Tonglu, sur la frontière du Nepal, entre 3050 et 3660 m. d'alt., 3 ex., juin et sept. 1920 (*H. Stevens*). Type in coll. H. E. Andrewes.

Long. 5 mm. Aptère, large, avec la tête grosse et arrondie, les élytres très larges (2 mm. de larg.). Noir lisse et très brillant, parfois la tête et le pronotum rougeâtres ; marge des élytres, antennes, pièces buccales et pattes d'un brun rougeâtre. Téguments lisses, non alutacés, glabres.

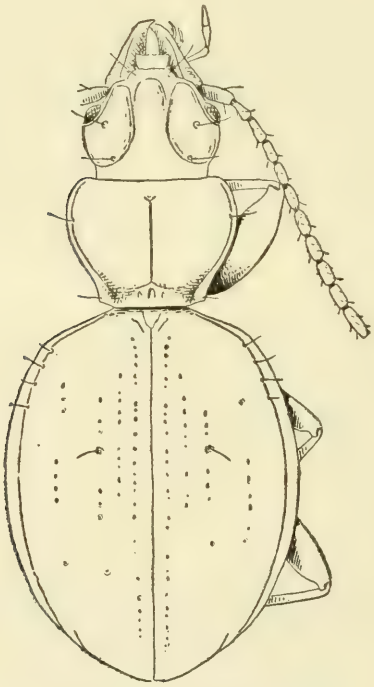
Tête plus longue que large, presque aussi longue et à peine plus étroite que le pronotum, le cou très épais. Sillons frontaux allongés, non anguleux sur le vertex. Yeux petits et plus ou moins saillants, bien plus rapprochés de l'insertion des antennes que du sillon du cou, les tempes très renflées, deux à trois fois aussi longues que les yeux. Antennes assez courtes, dépassant un peu les épaules ; l'article 2 plus court que le 3, aussi long que le 4, les articles apicaux (7–10) ovales, une fois et demie aussi longs que larges, le dernier un peu plus long que l'avant-dernier.

Pronotum guère plus large qu'un seul élytre, peu transverse, environ d'un quart plus large que long, très rétréci à la base qui est aussi large que les deux tiers du bord antérieur. Celui-ci droit ; les côtés bien arrondis, rétrécis

et sinués en arrière, les angles postérieurs obtus, vifs, nullement saillants en dehors, mais fortement relevés ; base saillante, avec les parties latérales obliques. Disque bien convexe, uni, le sillon longitudinal médian superficiel ; gouttière marginale étroite, s'élargissant en arrière ; impression basale profonde, fossettes larges et profondes.

Elytres suborbiculaires, environ d'un tiers plus longs que larges, le bord basal long, subdroit, très oblique, les angles

Fig. 18.



Stevensius lampros, sp. n., de Tonglu.

huméraux à peine marqués, les côtés bien arrondis, le sommet atténué. Gouttière marginale large et régulière ; disque avec de vagues traces des stries internes, sa surface unie, polie, très brillante, la strie récurrente apicale droite, oblique, peu à peu effacée en avant.

Pattes courtes ; les fémurs non renflés, les tarses courts.

Œdeagus bien arqué à sa base, la partie apicale allongée, la face ventrale large et plane, droite, la face dorsale renflée.

Le sommet est très fortement asymétrique, tordu à gauche et se termine par un petit bec arrondi et retroussé en crochet du côté dorsal.

Chétotaxie. — Lignes orbitaires fortement divergentes. Pore prothoracique antérieur situé au tiers antérieur des côtés ; pore postérieur sur l'angle. Pore discal placé un peu avant le milieu de l'élytre, sur l'emplacement de la 3e strie.

XLIV.—*On a remarkable Case of Sex-dimorphism in the Genus* Sepia. By Anne L. Massy and Guy C. Robson, M.A.*

In June 1920 Prof. J. D. F. Gilchrist, when conducting a marine biological survey off the coast of Natal for the Union Government of South Africa, obtained six complete examples of the cuttlefish *Sepia* (*Doratosepion*) *confusa*, E. A. Smith. In September of the same year Mr. H. W. Marley, while working in the same area for the Natal Museum, obtained a seventh example of this species. Prof. Gilchrist forwarded his examples (as part of a rich Cephalopod collection now under examination) to the British Museum (Natural History); while Mr. Marley sent his collection to the Ministry of Fisheries, Dublin. A re-description of Smith's species is in course of preparation by one of us (A. L. M.); but, owing to the remarkable sexual dimorphism discovered in these specimens, it has been decided to publish a separate account of this feature based upon our collective material.

D. confusa was first described by Smith in 1917 (3), the description being based wholly on the shell of specimens obtained at Tongaat Beach (Natal) and Port Elizabeth (Cape Colony).

We are now in possession of seven complete examples, of which four are males and three are females. Diagnosis of sex is made from the actual reproductive organs. There is no trace of hectocotylization in the male. In all four males a structural peculiarity is found, which, as far as our information goes, is unique among Myopsid Cephalopods. The lateral fins, instead of terminating as usual at the

* This author's part of the joint work is published by permission of the Trustees of the British Museum.

aboral extremities in narrow rounded off ends, are prolonged like a "tail" beyond the aboral extremity to a distance exceeding the total length of the mantle. *D. confusa* has a rather narrow elongate mantle, and in the female the fins are fairly narrow, though they widen out somewhat aborally. In the male they widen out considerably, and at about two centimetres from the aboral extremity they are each more than half as wide as the mantle. Just abreast of the extremity of the mantle and the commencement of the "tail" two asymmetrical thickenings of the fin are found, one on each side.

The following are the details of the condition found in the four males :—

1. [A. L. M.] "No. 16, Natal Coast" (Marley, 20. 9. 21).

The right fin is continued as a broad flattish plate for about two centimetres beyond the aboral extremity. Then it narrows down to a lash-like filament, the whole measuring some 130 mm. The left fin has been torn off at a level with the extremity of the mantle, but was obviously elongate like the other.

2. [G. C. R.] From 31° 18′ E., 29° 51′ S. (Gilchrist, 16. 6. 20). 180 fathoms.

The fins are prolonged as a single thin "tail" measuring 102 ± 2 mm. The edges are somewhat thickened and undulating, and at the distal extremity is found on each side a special thickening covered with purple pigment on the dorsal surface (v. below, p. 437). The median area is thin and distinguished by a double, finely pigmented line, enclosing a thin median portion, which is perforated in places. The whole surface is covered with irregular longitudinal ridges.

3. [G. C. R.] From approximately the same area (Gilchrist, 10. 6. 20). 192 fathoms.

The fins are continued as two long "tails," about 110 mm. long ($1\frac{1}{4}$ times as long as the mantle). It is impossible to say if they are separate as a normal condition or if they represent the single "tail" of No. 2 divided longitudinally as the result of a lesion, as might well be the case. Structure etc. as in No. 2.

4. Same data as in No. 3.

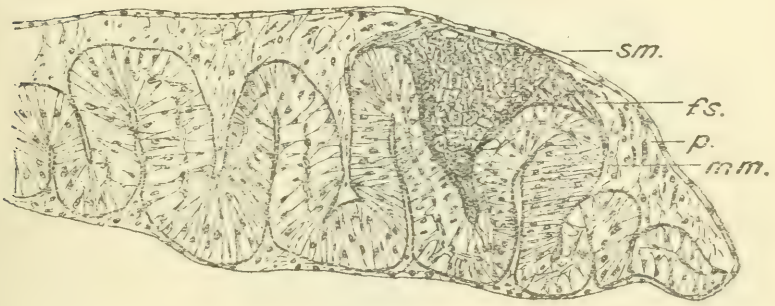
The fins are continued separately for about 15 mm. They appear to have been torn off as in the case of the left fin in No. 1.

In all cases the "tail" is fleshy and devoid of supporting structure, except the two pads or thickenings near the mantle extremity, which are strong and fairly rigid.

The most distinctive features, however, are the lateral pigmented ridges. They have been examined by means of sections by one of us (G. C. R.). It is to be understood that the latter is alone responsible for the statements that follow.

Viewed microscopically these ridges are narrow thickened portions of the edge of the "tail." They are placed symmetrically on each side of the latter about 15 mm. from its distal extremity. They measure about 30 mm. in length by 2–3 mm. in width. On the dorsal surface is found a double row of purplish pigment covering the ridges on each side.

Fig. 1.



Doratosepion confusa, Smith. Transverse section of "lateral organ."
mm., main muscular band: *fs.*, muscle-fibres inserted into secretory (?) mass; *sm.*, secretory (?) mass; *p.*, pigment. (4 oc. × 6 oc., Reichert.)

On the ventral surface these are absent; but there is a faint uniform scattering of pigment spots. The actual edges of the "tail," along which the ridges are placed, are free of pigment. Between the two pigment-bands on the dorsal surface is seen a median specialized tract or rachis, which is rather harder to the touch than the surrounding tissues and coloured a faint cinnamon-brown in formalin preservation. A section through one of the ridges (fig. 1) shows the following distinctive features. The main substance of the ridge is occupied by a thick band of muscular tissue, in which the fibres are disposed longitudinally, transversely, and at right angles to each other. Along with the muscle-fibres is found a quantity of what is apparently connective tissue.

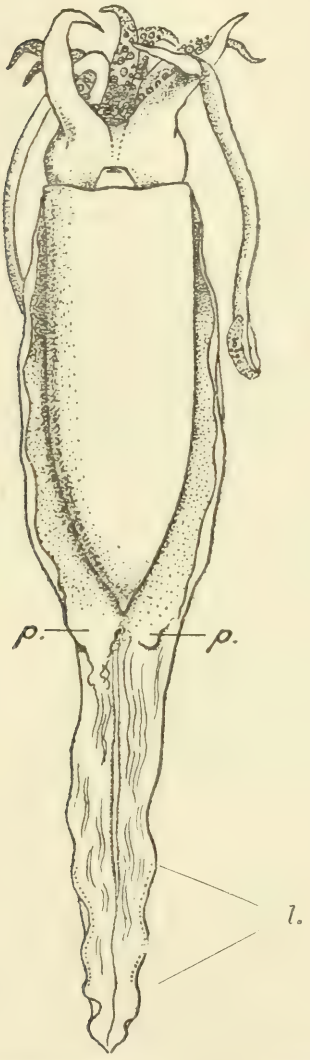
The whole of this band is thrown into pronounced vertical folds, which are not reproduced on the outer surface. The central rachis is seen to be composed of a triangular mass of highly vacuolated tissue, the apex of which is continued down one of the folds in the muscular band. Another series of muscle-fibres, independent of the main band, is inserted into the sides of the rachis. The vacuoles in the cells of the rachis are filled with inclusions of a very remarkable appearance (fig. 2). Examination shows them to be thin homogeneous plates of some undifferentiated substance, distinguished by numerous transverse folds, which gives them, under a low power, a curious ribbed appearance. In preparations from two different animals (Nos. 2 & 3) the

Fig. 2.

Doratosepion confusa. Part of secretory (?) mass, showing inclusions (*i.*). ($\frac{1}{17}$ hom. imm. × 4 oc.)

staining of these inclusions was markedly different. In one series of preparations (No. 3), from a specimen originally preserved in formalin, but ultimately transferred to alcohol, they have taken up the eosin in an ordinary eosin and hæmatoxylin (Delafield) stain. In the other case (permanent preservation in formalin) they took up the hæmatoxylin and none of the eosin. The technique was the same in both cases and the same time was allowed for staining and differentiation. An observation which requires further confirmation, but seems accurate, is that these plates are connected by intermediate stages with similar but smaller plates lying outside the special area of vacuolated cells, and apparently formed inside certain elongate cells found in this area. It

Fig. 3.



Doratosepion confusa, Smith. ♂. × ⅔. Ventral surface.
l., area occupied by the lateral organ; *p.*, thickening at base of "tail."

should be stated that the different staining reaction observed is accompanied by a difference in size and thickness. The eosin-stained plates are larger and thicker.

The general appearance of this mass of tissue is that of a series of vacuoles, each containing a secretory mass. It is impossible without further study and consideration to determine the nature of this structure; and, although I have submitted the preparations to several workers of considerable experience in histology, I have received no definite determination of the tissue in question*. Chun (1) has described an organ containing rather similar enclosures in *Chiroteuthis*. He considers them to be secretory, and possibly employed for stupefying the animal's prey. The nature of the underlying muscular layer is a little more obvious. From a study of sections of the edge of the "tail" in an area not occupied by the "lateral organ," we may conclude that the muscular band found in the latter is, in structure at least, not essentially different from the general muscular tissues of the "tail." These may be, in fact, derivatives of the true fin-tissues; but, if that is the case, they differ in detail from the arrangement of the fibres in the fin of *Sepia* figured by Meyer (2), and, in particular, in the absence of two *separate* (dorsal and ventral) sheets of fibres. It should also be noted that where the muscular band underlies the lateral organ it is very much thicker and more folded.

Other elements to be noted in the region of the lateral organ are peculiar elongated subepidermal pigment-masses and the two lateral tracts of muscle-fibres which are inserted into the secretory (?) tract on each side.

The whole of this structure will be made the study of an exhaustive study at a later date, and until that is complete it is useless to speculate on the nature and function of this organ—if, indeed, it can be so called. We may conclude that it is not sensory, owing to the lack of any particular nerve-tissue. It is very doubtful whether it is a light-organ of any sort. At present we can only surmise that it may in some way at present unknown serve to attract the female by means of the secretion. It is interesting to note that it is developed in a form apparently lacking a hectocotylus.

Reverting to the "tail" itself, we can have little hesitation

* The absence of any definite evidence at this stage as to the nature of these inclusions renders it necessary to state that the bulk of the evidence is in favour of their being secretory in origin.

in accepting it as a sex-limited character analogous to the difference in arm-length observed by Wülker (4), and confirmed by one of us for *Sepia burnupi* (A. L. M., in MS.). It would perhaps be more satisfactory if we had more examples of each sex; but in view of the figures available [total specimens 7: ♂ 4 (all with "tail"), ♀ 3 (all lacking "tail")] it is very unlikely that a further supply would yield any other result. It is likewise highly improbable that the "tail" is a pathological growth.

It would be interesting to know if this "tail" is of seasonal or local occurrence. We can only note on the first issue that one male was caught in September, the other males in June. As to the question of locality, all we are able to state is that the three accurately localized forms were obtained within a few miles of each other, but after an interval of six days.

Whether the "tail" has a function or not, and what the latter might be, are at present matters for speculation. It has been suggested that in swimming with the aboral extremity forwards the "tail" would be more or less useless. We may, however, point out that it is now known that squids at least sometimes swim in the reverse position by bending the siphon-aperture aborally, and we are indebted to Mr. G. P. Farran for an account of this phenomenon in *Stenoteuthis* sp. It is likely that any Decapod with a reasonably long siphon could swim in this fashion. If the "tail" is in any way subservient to sexual functions, it is likely to be of use as some means of attraction. It is true that the pads at the base of the "tail" seem strong enough to act as an attachment for muscles, which might convert the "tail" into a lash or other stimulant. But, if the copulation of *D. confusa* is at all like that of the European species, then, owing to the relative shortness of the "tail," the latter could only take effect on the outside of the mantle-region of the female ("Männchen und Weibchen von *Sepia* sieht man stundenlang Kopf gegen Kopf mit verschlungenen Armen dicht am Grunde des Aquariums schweben," Meyer, *l. c.* p. 85). Until more evidence is available we can only infer that the "tail" has a more passive rôle, and that it may constitute a means of displaying or directing some secretion attractive to the female.

Our thanks are due to Prof. J. P. Hill, F.R.S., Prof. A. E. Boycott, F.R.S., and Prof. A. Kultschitzki, who kindly examined the tissue of the lateral organ for us.

Literature.

(1) Chun, C. Ergebn. Deutsche Tiefsee Exp. 1910, 18, i. p. 249.
(2) Meyer, W. T. Tintenfische (Monographien einheimischer Tiere), Leipzig, 1913.
(3) Smith, E. A. Proc. Mal. Soc. xii. 1917, p. 24.
(4) Wülker, G. Japanische Cephalopoden. Munich, 1910.

XLV.—*Papers on Oriental* Carabidæ.—XI.

By H. E. Andrewes.

In this paper I am describing two new genera and fourteen new species, all from South India, chiefly from the Palni and Nilgiri Hills, and from Madura. A number of these species were already represented in my collection, but others are contained in various collections entrusted to me for examination. Among these I may mention one recently formed by Dr. S. W. Kemp in the Palni Hills on behalf of the Zoological Survey of India, and another from the same locality made by Dr. T. V. Campbell and now in Dr. E. A. Butler's possession. Some examples were also taken in the Nilgiri Hills by Dr. Campbell and by Mr. H. L. Andrewes, the remainder coming from the collections of Messrs. H. de Touzalin, G. Babault, and C. Alluaud. Two of the type-specimens are in the Indian Museum, the remainder, for many of which I am indebted to the liberality of my correspondents, being in my own collection.

Bembidium braminum, sp. n.

Length 4·0–5·0 mm.; width 1·5–1·8 mm.

Black beneath, upper surface dark bronze; palpi and legs more or less piceous, joint 1 of antennæ beneath, base of 2–4, and apex of elytra reddish.

Head convex, smooth, with deep and rather wide furrows, extending forward to clypeal pore, diverging behind, some slight cross-striation at bottom, eyes moderately prominent, a few punctures on each side behind. *Prothorax* convex, cordate, a little wider than head and nearly half as wide again as long, base gently arcuate, sides rounded and faintly sinuate behind, hind angles a little obtuse, but not rounded, with a slight carina; median line short but deep, not nearly reaching extremities, front transverse impression shallow, hind one deeper, foveæ deep and rounded, base with some sparse punctures, surface generally smooth, though with

faint cross-striation. *Elytra* convex, ovate, not much contracted in front, nearly half as wide again as prothorax and rather more than half as long again as wide, side border just reaching stria 5; striæ fine, very clearly punctate, 1 deepening towards apex, where the suture is raised, 2 visible throughout and deep close to apex, the remainder very faint behind, 7 obsolete, 8 deep behind, joining marginal channel in front, apical stria rather deep, scutellary striole short; intervals flat, two large dorsal pores on stria 3. The microsculpture (♂ ♀) consists of transverse reticulations, very clear on the elytra, which are consequently glossy, but nearly obsolete on disk of prothorax. Underside smooth, metasternal process bordered.

In spite of the colour of the antennæ the species seems to agree better with *Testediolum* than with *Peryphus*. Of the same size as *T. kokandicum*, Sols.; head a little wider, sides of prothorax less sinuate behind, the angles consequently obtuse, the carina more rudimentary, dorsal pores on elytra larger, the microsculpture finer, with much more transverse reticulation.

Madras: Palni Hills, Kodaikanal, 6700–7200 feet, on shores of lake and banks of pool (*Dr. S. W. Kemp*—Ind. Mus.). The type is in the Indian Museum, Calcutta.

Harpalus meridianus, sp. n.

Length 12·0–13·0 mm.; width 4·2–4·6 mm.

Black, shiny, elytra of ♀ sericeous at sides and behind; palpi, joints 1–2 of antennæ and legs testaceous, rest of antennæ, tarsi, and median line of body beneath brown.

Head wide and very smooth (though with some microscopic punctures), frontal impressions punctiform, eyes moderately prominent, antennæ short. *Prothorax* moderately convex, about a third as wide again as head, and as much wider than long, extremities truncate, wider at base than apex, sides gently rounded in front and thence straight to hind angles, which are a little obtuse and very slightly rounded, narrowly bordered throughout, except middle of front margin; median line fine, transverse impressions very slight, basal foveæ distinct but shallow, base closely and confluently punctate, though nearly smooth in middle, the puncturation running forward along marginal channel to front angles and extending a little way along front margin. *Elytra* convex, rather wider than prothorax, and three-quarters as long again as wide, widest at middle and a little contracted close to base, basal border slightly curved to

shoulder, where it forms a small tooth; striæ deep, impunctate, the striole rather long, intervals moderately convex, more so behind, 3 without pore, 8–9 finely and closely punctate, a few fine pores on the two adjoining intervals, disk practically smooth. Sterna and base of venter closely punctate, but proepisterna (nearly) and middle of metasternum smooth, metepisterna nearly twice as long as wide; hind femora with four to five setæ along hind margin, front tibiæ not dilated at apex, the spur with a distinct tooth on each side at base, tarsi setiferous on upper surface.

Belonging to the subgenus *Pardileus* and closely allied to *H. indicus*, Bates. In that species the antennæ and legs are darker, the prothorax more contracted behind, the base more finely punctate and only indistinctly bordered, the elytra rather shorter and less deeply striate, intervals 8–9 almost impunctate. *H. sinicus*, Hope, from China and Japan, is even more nearly related, but in that species the sides of the prothorax are more evenly rounded, the hind angles a little more obtuse, the base more finely punctate, with the puncturation as a rule stretching across it.

Madras: Nilgiri Hills (*H. L. Andrewes*—type), Utacamand (Pusa coll.); Palni Hills, Kodaikanal, shores of lake, 6850 feet (*Dr. S. W. Kemp*—Ind. Mus.). Bombay: Nasik (*N. B. Kinnear*—Bomb. Nat. Hist. Soc.).

Oesyperus, gen. nov.

Body covered with a very short, sparse, almost invisible pubescence.

Head wide and convex, with a single supraorbital pore, placed at some distance from eye. Eyes glabrous, flat, separated from buccal fissure. Antennæ short, submoniliform, joints 1–2 more or less pubescent, though less so than the other joints. Labrum sexsetose, slightly emarginate. Mandibles strong, curved, and pointed, a small tooth at middle of right one, no seta in the scrobe. Mentum with a sharp simple tooth and rounded lobes, the epilobes extending a little beyond them. Ligula narrow, free, truncate, and bisetose; paraglossæ rather narrow, setulose, extending rather beyond ligula. Maxillæ sharp and strongly hooked. Palpi setulose, acuminate but truncate at extreme apex; maxillaries with apical joint half as long again as penultimate, labials with penultimate long and slender, slightly longer than apical joint. *Prothoraæ* very finely and narrowly bordered, a single marginal seta before middle, base unbordered. *Elytra* 9-striate, a scutellary striole between

1 and 2, base bordered, no specialized dorsal setæ, marginal series irregular. Prosternal process setulose. Ventral segments with a single seta, apical segment (♂ ♀) with two setæ on each side. Legs short, tarsal joints short, rounded, pubescent above, 4 emarginate, in metatarsi 1=2+3, pro- and mesotarsi ♂ slightly dilated, in former joints 1–4, in latter 2–4 scaly beneath.

Quite distinct from any Harpaline genus known to me. The palpi are similar to those of *Platymetopus*, but the labium is very different: the body also is finely and sparsely, not densely and closely setose.

Oesyperus unctulus, sp. n.

Length 9·0–10·0 mm.; width 3·0–3·5 mm.

Black, shiny, rather greasy in appearance; palpi, antennæ, and legs testaceous.

Head with shallow foveæ, a fairly deep oblique furrow connecting suture with eye, clypeus bisetose, depressed in front, a little strigose at sides, antennæ with joint 3 quite half as long again as 2, and a little longer than 4, surface irregularly and not closely punctate, neck smooth. *Prothorax* cordate, quite half as wide again as head, but barely a third wider than long, about equally contracted at extremities, sides of base very slightly oblique, apex widely emarginate, sides nearly evenly rounded and faintly sinuate behind, the hind angles a little obtuse, but not rounded; median line short but clear, transverse impressions rather slight, basal foveæ wide and shallow but elongate, diverging outwards in front, surface not very closely punctate, more sparsely on disk, basal area vaguely strigose. *Elytra* ovate, sides strongly rounded, distinctly sinuate near apex, which is rather pointed, base bisinuate, the border forming a rounded angle at shoulder; striæ clearly impressed, impunctate, striole short, sometimes obsolete, intervals convex at sides and behind, 3 with several pores behind, which do not bear setæ longer than those of the general pubescence, surface rather finely and not closely punctate. Body beneath finely and sparsely punctate, sides of prosternum and the procpisterna practically smooth, metepisterna not much longer than wide.

Madras: Palni Hills, Kodaikanal, 6900–7200 feet, and shores of lake, 6850 feet (*Dr. S. W. Kemp*—Ind. Mus. and *Dr. T. V. Campbell*—coll. E. A. Butler). I am indebted to Dr. Butler for the type of this species.

Oesyperus planus, sp. n.

Length 11·5 mm; width 3·8 mm.

Closely allied to *O. unctulus* and similarly coloured, but duller, flatter, and more elongate. The head hardly differs. Prothorax with sides of base more oblique, sides evenly rounded, not sinuate behind, the angles more obtuse and rounded, median line very fine, basal foveæ obsolete, surface more finely and closely punctate, especially along base. Elytra much longer and flatter, striole longer, intervals flatter, though moderately convex at sides and behind, 3 with a more evident series of six to eight pores along middle.

Madras: Madura, Shembaganur (coll. de Touzalin), 2 ex. I am indebted to Mr. H. de Touzalin for the type.

Oesyperus pygmæus, sp. n.

Length 6·0–6·5 mm.; width 2·1–2·3 mm.

Similarly coloured to *O. unctulus*, but the palpi, antennæ, and legs lighter; much smaller in size, narrower, and more convex in form. *Head* relatively a little wider, eyes smaller and a little more convex, the genæ less apparent. *Prothorax* with extremities truncate, sides without sinuation, more contracted behind than in front, so that base is narrower than apex, hind angles more obtuse, but not rounded, median line finer, foveæ very shallow and inconspicuous, surface similarly punctate. *Elytra* more convex, sides rather less rounded, basal border nearly straight, intervals nearly flat, hardly more convex at sides and behind than on disk, 3 without any pores which are evidently larger than those of the general puncturation, which is equally fine and a little closer.

Madras: Palni Hills, Marian Shola, 7200 feet, under rotten wood in dense jungle (*Dr. S. W. Kemp*—Ind Mus.). The type is in the Indian Museum, Calcutta.

Genus Ophoniscus.

Bates, Ann. Mus. Civ. Gen. 1892, p. 337.

Following the description of the genus are the descriptions of three new species. The author does not refer to *Curtonotus compositus*, Walk. (Ann. & Mag. Nat. Hist. (3) ii. 1858, p. 204, and Andr. Trans. Ent. Soc. Lond. 1919, p. 189), from Ceylon, which he redescribed (Ann. & Mag. Nat. Hist. (5) xvii. 1886, p. 76) under the name of *Siopelus ferreus*. This insect is quite unlike such species of the African genus *Siopelus* as I have seen, whereas it bears a strong resemblance to those

of *Ophoniscus*. I have dissected the buccal organs of a Ceylon specimen, and find them to agree entirely with those of the latter genus, to which I think Walker's species should be referred. It is not confined to Ceylon, but occurs also in South India, and I have recently seen examples from Madura and from the Palni Hills (*Dr. S. W. Kemp*).

Harpaliscus punctulatus, sp. n.

Length 8·5–9·5 mm.; width 3·2–3·4 mm.

Black, shiny, sometimes faintly iridescent; palpi, antennæ, and legs testaceous, labrum, margins of ventral segments, and apical border of elytra reddish. *Head* wide, convex, smooth, though with some minute scattered puncturation, labrum slightly emarginate, antennæ reaching a little beyond base of elytra. *Prothorax* rather wider than head, not quite half as wide again as long, extremities truncate, sides rounded and bordered, faintly sinuate before base, a single seta at apical third, hind angles sharp, though very slightly obtuse; median line and transverse impressions slight, foveæ shallow and vague, surface very finely punctate, disk minutely, basal area more conspicuously. *Elytra* with nearly parallel sides, basal border straight, forming a very obtuse angle at shoulder, a slight sinuation in sides near apex; striæ fairly deep, impunctate, striole moderately long, intervals flat, but convex close to apex, 3 with a row of six or seven punctures adjoining stria 2, surface minutely and sparsely punctate, more closely and evidently at sides and near apex. Beneath the body is finely though not closely punctulate and pubescent, prosternal process unbordered, pilose, metepisterna much contracted behind, twice as long as wide, ventral segments with a single seta, apical segment (♂ ♀) with two setæ on each side.

A little larger than *H. birmanicus*, Bates. Head and prothorax a little wider, the latter with rather sharper hind angles, its surface punctate throughout and much more evidently so on middle of base, elytra less deeply striate, intervals consequently flatter, the surface minutely punctate, and much more evidently so at sides.

Madras: Nilgiri Hills, Naduvatam, 6000 feet, Pillur, 5000 feet, Ouchterlony Valley, 3500 feet (*H. L. Andrewes*), Utakamand (*E. E. Green*); Palni Hills, Kavungi to Kukkal, Neutral Saddle, and Kodaikanal Lake, 6850 feet (*Dr. S. W. Kemp*—Ind. Mus.); Shevaroy Hills, Yercaud (Agric. Coll. Coimbatore); Madura. The species seems to be a very common one in the South of India.

Colpodes euparyphus, sp. n.

Length 8·0–9·0 mm.; width 2·8–3·0 mm.

Black, shiny, more or less piceous beneath, sometimes red, elytra a dark bluish green, sometimes æneous, and rather glossy; base of joints of antennæ, base and apex of palpi, legs, border of elytra, and prosternum ferruginous, side-margin of prothorax a little lighter. *Head* convex and smooth, with rather wide and deep furrows, eyes prominent, antennæ long and slender. *Prothoraæ* moderately convex, distinctly wider than head and a little wider than long, base arcuate with oblique sides, apex truncate, equally contracted at extremities, sides moderately explanate, unbordered, reflexed, front seta just within, hind one on the margin, all angles rounded, but hind ones distinct though obtuse and strongly reflexed; median line and transverse impressions rather shallow, foveæ deep and rounded, surface smooth with some vague cross-striation, base and foveæ finely and indistinctly punctate. *Elytra* moderately convex and rather elongate, not quite half as wide again as prothorax, and three-quarters as long again as wide, slightly dilated behind, surface faintly depressed on each side just before middle, margin faintly sinuate at basal third and again near apex, sutural interval ending in a minute tooth; striæ moderately deep and finely punctate, intervals only slightly convex and not any more so at sides and near apex, 3 with three dorsal pores, marginal series large and uninterrupted, surface quite smooth. Underside smooth, metasternal process bordered between mesocoxæ, metepisterna moderately long, sulcate on outer and inner margins, last ventral segment bisetose in ♂, quadrisetose in ♀, meso- and metatarsal joints sulcate on outer side only, joint 4 deeply emarginate, protarsi with inner side, mesotarsi with outer side a little longer, metatarsi with only a slight regular emargination.

Very similar to *C. iteratus*, Bates, from Ceylon, but rather larger, the prothorax wider and with more rounded sides, the sides of base less oblique, elytra with a narrower and darker ferruginous border, sutural interval ending in a slight tooth.

Madras: Palni Hills, Kodaikanal Lake shore, 6850 feet (*Dr. S. W. Kemp*—Ind. Mus.), and Kodaikanal (*Dr. T. V. Campbell*); Mysore, Chikkaballapura (*Dr. T. V. Campbell*—coll. E. A. Butler). Dr. Butler has kindly allowed me to retain the type in my collection.

Broter, gen. nov.

Body elongate and rather convex. *Head* very convex and very slightly contracted behind, two large supraorbital setiferous pores on each side, the posterior one far behind and distant from eye, eyes very flat, adjoining buccal fissure. Antennæ slender, pubescent from joint 4, which is twice as long as 2, the other joints about equal, a little shorter than 4. Labrum narrow, quadrate, sexsetose, slightly emarginate, clypeus bisetose. Mandibles elongate, narrow, sharp, edentate, only slightly curved at apex, and without any seta in the scrobe. Mentum with a simple tooth, nearly as long as lobes, epilobes projecting at apex of lobes in the form of a sharp tooth. Ligula short, arcuate at apex, bisetose, paraglossæ small and narrow, projecting some distance in front of ligula, with two or three relatively large setæ on their outer margin. Maxillæ moderately long and not much curved, even at apex, crenulate and furnished with short bristles practically from base to apex. Palpi long, slender, and glabrous, truncate at apex: maxillaries with 2 widely dilated behind, 3 much longer than 4, labials with 2 very slender, bisetose, distinctly longer than 3. *Prothorax* elongate-oval, a reflexed side-border, no basal border and no marginal setæ. *Elytra* 9-striate, a striole between 1 and suture, basal border entire. Ventral segments with a single seta, apical segment (♂ ♀) with two setæ on each side. Legs long, slender, and finely setulose; tarsi glabrous above, clothed with long setæ at sides, joint 4 small and emarginate, 5 elongate; metatarsi with joint 1 = 2 + 3 = 5; protarsi ♂ furrowed on upper surface, joints 1–3 dilated and squamulous beneath; claws simple.

Not unlike *Stomis* in appearance, but without the long first antennal joint. In form resembling *Euleptus*, but smaller and shiny; in that genus, however, there is no tooth in the mentum, while on the other hand there is a seta present on the site of the hind angle of the prothorax. The different form of the antennæ, palpi, and eyes, as also the absence of marginal setæ on the prothorax, distinguish the genus at once from *Anchomenus*.

Broter ovicollis, sp. n.

Length 7·0–8·0 mm.; width 2·6–2·9 mm.

Black, shiny; palpi, antennæ, and legs testaceous.

Head convex, genæ very oblique, eyes projecting very little

beyond general surface, frontal furrows short and shallow. *Prothorax* convex, ovate, wider than head and slightly longer than wide, contracted more behind than in front and widest at apical third, extremities truncate, sides gently rounded, marginal channel gradually widening towards base, hind angles quite rounded away; median line fine but distinct, transverse impressions obsolete, basal foveæ very slight and quite at sides of base, surface smooth with faint indications of cross-striation. *Elytra* convex, oval, nearly half as wide again as prothorax, and quite half as long again as wide, sides evenly rounded, basal border bisinuate, running sharply forward on each side to form a very marked angle at shoulder; striæ very faintly crenulate, moderately deep on disk, deeper at apex, 1 curving outwards in front and joining 2 in an umbilicate pore, 1–2 and 7–9 reaching apex, 3–4 terminating rather before apex, and 5–6 a little further back; intervals slightly convex, more so behind, 3 with two pores adjoining stria 2, one behind middle and the other towards apex, marginal series on 9 practically uninterrupted. Prosternal process slightly channelled, glabrous at apex, metepisterna as long as wide.

Madras: Palni Hills, Kodaikanal, 6850–7200 feet, under rotten wood in jungle (*Dr. S. W. Kemp*—Ind. Mus.), several examples, and (*Dr. T. V. Campbell*—coll. Butler) 1 ex.; Madura, Shembaganur (coll. Touzalin), 4 ex., and (*P. du Breuil*—coll. Babault) 1 ex. For the type I am indebted to Mr. H. de Touzalin.

Dolichoctis convexus, sp. n.

Length 6·0–7·0 mm.; width 2·6–2·75 mm.

Black, shiny; antennæ, legs (except femora), margins of prothorax and elytra ferruginous, maxillary palpi piceous with light apex.

Head moderately convex, smooth, frontal furrows very shallow and inconspicuous, eyes prominent, hind supra-orbital unusually distant from eye. *Prothorax* convex, wider than head, and about half as wide again as long, base truncate, apex widely emarginate, sides strongly rounded and reflexed, the explanate margin widening from apex to base, hind angles very strongly rounded, a seta on the margin at their site, but no seta in front; median line fine, but clearly marked, base gently depressed, the foveæ indistinct, surface smooth, a little uneven along base. *Elytra* broadly ovate, very convex, two-thirds as wide again as prothorax, about a fourth longer than wide, base bisinuate, apex truncate, with

a re-entrant angle at suture, truncature hardly emarginate; striæ finely crenulate, moderately impressed on disk, more deeply near apex, none of them quite reaching base, striole very slight, intervals rather flat on disk, moderately convex behind, 3 with two small pores rather behind middle and not far apart, the front one near stria 2, the hind one near stria 3, sides compressed behind shoulder on intervals 8–9, the pores of the marginal series often arising from irregular excrescences both before and behind. Underside smooth. Legs long and slender; the teeth in the claws a little longer at middle than at base. The microsculpture is very distinct, especially that of the head, which is isodiametric; on the prothorax it is finer, with slightly transverse meshes, and on the elytra still finer and strongly transverse.

Rather larger and more convex than *D. tetracolon*, Chaud., without any spots on the elytra. Head nearly similar; prothorax longer, the explanate sides narrower in front and without seta at middle, hind angles almost entirely rounded off; elytra with wider marginal channel, the striæ deeper behind, sides more compressed behind shoulder, marginal series more irregular.

Madras: Palni Hills, Kodaikanal (*Dr. S. W. Kemp*—Ind. Mus. and *Dr. T. V. Campbell*—coll. Butler); Madura, Shembaganur (coll. Touzalin, coll. Alluaud, and my coll.).

Cymindoidea æqua, sp. n.

Length 10·5–12·5 mm.; width 3·75–4·5 mm.

Black, rather dull; underside and most of palpi piceous; base and apex of palpi, joint 1 of antennæ, and legs ferruginous; rest of antennæ, tarsi, margins of prothorax and elytra (rather faintly), and middle of venter more or less brown.

Head large, with inflated genæ, which extend outwards as far as eyes, labrum sparsely and minutely punctate, frontal furrows very short and narrow, surface densely longitudinally striate, the striæ more or less confluent, some punctures among them, joints 2 and 3 of antennæ with some setæ on apical half. *Prothorax* semi-elliptical and rather flat, about a fourth wider than head and very little wider than long, base slightly produced in middle, apex widely emarginate, front angles rounded, sides gently rounded and reflexed, hind angles quite rounded away, front seta within the border at a fifth from apex, hind one on the border, where it forms a faint blunt tooth; median line sharply incised, the other impressions obsolete, surface finely and densely punctate-rugose, more coarsely along base, some longitudinal striation

near front margin. *Elytra* flat, more or less oval, half as long again as wide, a little less than half as wide again as prothorax, base emarginate, apex truncate, the abdomen extending some little way beyond it, the sides explanate ; striæ very clear, though shallow, and finely punctate, a row of fine punctures also just inside the border, intervals nearly flat, 3 with two fine pores on middle at just behind a third and two-thirds, 2–5 narrower at base, 8 wider, pores of marginal series rather far apart, surface smooth, but with a very distinct punctate-asperate microsculpture. Underside smooth and glabrous, the lower half of the claws with four or five very clear denticulations.

Slightly smaller than *C. indica*, Schm. Goeb., but differing little in shape, though the hind marginal pore on the prothorax forms a much less evident tooth, and the elytra are narrower, with more sharply rounded shoulders. The surface is shagreened instead of coarsely cribrose, and this puts it into the section of Chaudoir's memoir containing his *C. nigra* (Bull. Mosc. 1875, iii. p. 19). From this species it will readily be distinguished by its larger size and the smooth opaque surface of the elytra.

Madras : Palni Hills, Kodaikanal (*R. P. Castets*), 1 ex. ; Neutral Saddle, 5000 feet, under stones in orchard (*Dr. S. W. Kemp*—Ind. Mus.), 4 ex. Mysore : Nandidrug (*Dr. T. V. Campbell*—coll. E. A. Butler). I am indebted to Mr. Alluaud for the type-specimen.

Platytarus porcatus, sp. n.

Length 7·0–8·0 mm. ; width 2·0–2·5 mm.

Piceous black, dull ; femora testaceous, antennæ, palpi, margins of prothorax and elytra, ventral surface, tibiæ, and tarsi more or less brown.

Head flat, with flat eyes, not projecting beyond the genæ, which are rounded behind, neck slightly constricted, antennæ rather short and thick, surface densely longitudinally strigose. *Prothorax* flat, narrow, a little wider than head and a little longer than wide, sides bisetose, border denticulate, nearly straight in front, moderately contracted and faintly rounded behind to the hind angles, which project as a minute tooth, base strongly produced in middle, with a distinct emargination on each side, apex widely emarginate, the front angles slightly rounded ; median line deep and wide, carinate on each side, surface densely cribrose. *Elytra* flat, elongate, two-thirds as wide again as prothorax and rather less than twice as long as wide, shoulders sharply rounded, sides faintly rounded, border denticulate and setulose, slightly dilated

behind, base deeply emarginate, apex truncate, the truncature a little emarginate on each side; striæ fine but clearly punctate, suture and intervals 3, 5, and 7 carinate, the carina on 7 disappearing near base but reappearing on the inside of interval 8, the two parts overlapping, with a slight furrow between them, surface densely microscopically cribrose. Underside granulate; claws indistinctly denticulate.

Allied to *P. bufo*, F., and similarly coloured, though with lighter femora. The size is smaller and the form narrower. Head with larger eyes; prothorax narrower, the median line deeper, wider, and bounded by more evident carinæ; elytra narrower, the even intervals flat, the border (as also that of prothorax) conspicuously denticulate.

Madras (Madras Museum). Mysore: Nandidrug and Chikkaballapura (*Dr. T. V. Campbell*—coll. E. A. Butler). "India" (Oxford Museum—Hope Department). Dr. Butler has kindly allowed me to retain the type.

Metabletus monticola, sp. n.

Length 4·0–4·5 mm.; width 1·6–1·9 mm.

Black, shiny, upperside dark æneous, venter more or less piceous; palpi, antennæ, legs (femora sometimes fuscous), and a very vague shoulder-spot (often absent) testaceous.

Head convex, smooth, with short but quite distinct frontal furrows. *Prothorax* moderately convex, transverse, a little wider than head, middle of base produced, its sides oblique, with a distinct emargination between the two parts, sides strongly rounded close to the front angles, then gently contracted and nearly straight to the obtuse and somewhat reflexed hind angles, front lateral seta within, hind one on the border; median line and transverse impressions rather slight, surface smooth, but faintly wrinkled. *Elytra* convex, ovate, nearly twice as wide as prothorax, less than half as long again as wide, base rather deeply emarginate, apex truncate, border microscopically setulose at shoulder; striæ fine, indistinctly punctate, a little more distinctly impressed on basal half, intervals nearly flat, 3 with two pores, rather before middle and at apical fourth respectively, marginal series consisting of few but very large pores. The claws are very distinctly denticulate. The microsculpture is very clear throughout and isodiametric, though here and there the meshes of the reticulation become a little transverse.

Very similar in size and form to *M. cymindulus*, Bates, the elytra a little shorter, wider, and without pattern. The fine lines of the microsculpture are rather further apart and

less deeply impressed, so that the surface has a more shining and less evidently shagreened appearance.

Madras: Nilgiri Hills (*Dr. T. V. Campbell*—coll. E. A. Butler); Palni Hills, Kodaikanal (*Dr. S. W. Kemp*—Ind. Mus. and *Dr. T. V. Campbell*—coll. E. A. Butler), and on shores of Kodaikanal Lake at 6850 feet (*Dr. S. W. Kemp*—Ind. Mus.). I am indebted to Dr. Butler for the type-specimen.

Some examples of a variety of the typical form were taken by Mr. H. L. Andrewes, also in the Nilgiri Hills, at Naduvatam, 6000 feet, under stones in small "sholas" (patches of jungle) in hollows of open downs. These specimens do not average more than 4·0 mm. in length, and the elytra are very short and convex, with rather strongly-rounded sides. There is also a pale, vague, testaceous pattern, not unlike that of *M. cymindulus*, but the shoulder-spot is small, just covering the shoulder, and not shaped like an inverted comma, while the transverse fascia behind is both narrower and fainter. I call this var. *curtus*.

Risophilus macellus, sp. n.

Length 3·75–4·0 mm.; width 1·4–1·6 mm.

Piceous, rather shiny, venter and epipleuræ of elytra brown; labrum, antennæ, palpi, legs, and margin of elytra flavous. The apical margin is more widely flavous, but the piceous colour nearly reaches apex on intervals 1–2.

Head convex, with short but distinct frontal furrows and a further impression on each side, near eyes, which are very prominent, antennæ slender, reaching basal third of elytra, neck rather inflated, mentum with a sharp tooth, surface nearly smooth and very sparsely setose. *Prothorax* moderately convex, quadrate, slightly transverse, a little wider than head, base truncate, apex widely though only slightly emarginate, sides moderately reflexed and setulose, a little rounded near front angles, not contracted behind, though with a trace of sinuation, hind angles about right but a little rounded, a seta on the angle and another at apical fourth; median line fine, basal sulcus distinct, a callus on each side of base near hind angle, surface nearly smooth, minutely and sparsely setulose. *Elytra* convex, ovate, but with truncated apex, nearly twice as wide as prothorax and half as long again as wide, border very fine, rounded at shoulder; striæ lightly impressed and faintly punctulate, no scutellary striole, intervals nearly flat, 3 with two large umbilicate pores, not far from base and apex respectively, surface sparsely setulose,

the setæ chiefly following a line along the middle of each interval. The microsculpture is rather faint, isodiametric or slightly transverse. Underside sparsely setulose, claws rather strongly denticulate.

Not unlike *R.* (*Tetragonica*) *fuscus*, Motch., but a little smaller, sparsely pilose instead of glabrous, and with an apical flavous border. Head with smaller and more prominent eyes; prothorax not dilated behind, the angles less reflexed; elytra much shorter and more convex, the striæ only faintly impressed, the pores on interval 3 similarly placed.

Madras: Madura (*C. Somers-Smith*) and Shembaganur (coll Alluaud); Palni Hills, Kodaikanal (*Dr. T. V. Campbell*—coll. E. A. Butler), Kukkal, 6500 feet, on jungle-trees, and Kodaikanal Lake, 6850 feet, under stones (*Dr. S. W. Kemp*—Ind. Mus.).

Risophilus psilus, sp. n.

Very nearly allied to the preceding species and of nearly the same size and form, but differing as follows:—The surface, instead of being minutely punctulate and setose, is glabrous, the underside only showing a slight and hardly visible pubescence. Upper surface black; joint 1 of antennæ and femora flavous; joints 2–3 of antennæ, knees, tibiæ, and tarsi more or less piceous. The head hardly differs. *Prothorax* narrower, sides distinctly sinuate behind, the angles sharper and even projecting a little laterally. *Elytra* differing chiefly in the absence of the light apical border, but the truncature is more distinctly emarginate on each side and the outer angles less rounded.

Madras: Palni Hills, Kodaikanal (*T. B. Fletcher*—Agric. Res. Inst., Pusa, and *Dr. T. V. Campbell*), 2 ex. I am indebted for the type to Dr. E. A. Butler.

XLVI.—*On some Arachnid Remains from the Old Red Sandstone* (*Rhynie Chert Bed, Aberdeenshire*). By Stanley Hirst.

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[Plates XI.–XV.]

This note deals with fossil Arachnids from the Rhynie Chert. The Arthropods found in this deposit show a considerable amount of structural detail, even the secondary offshoots of the hairs being distinctly visible in certain cases. Unfortunately these remains are often fragmentary. There can

be little doubt, however, that, if a sufficient number of specimens could be collected from the Rhynie Chert, very important results throwing light on the ancestry of the Arachnida and other groups of Arthropoda would be obtained.

According to Handlirsch, Insecta do not occur either in the Silurian or Devonian strata. He states that *Palæoblattina* from the Silurian, which was formerly believed to be an orthopterous insect, is part of a Trilobite, whilst *Protocimex* possibly is only a *lusus naturæ*.

Peach has already shown that certain fossil myriopods (*Kampecaris* and *Archidesmus*) are found in the Old Red Sandstone. It seems probable that the forms described in the present paper are the earliest-known terrestrial air-breathing Arachnida discovered so far, for it is believed by Lankester and others that the Silurian scorpion (*Palæophonus*) was an aquatic animal. The mite is of especial interest, for members of this group have previously only been found as far back as the Tertiary period. The difficulty of detecting such small Arachnids in the fossil state, even when well-preserved, should be borne in mind, however.

Sincere thanks are due to Dr. W. T. Calman, F.R.S., Mr. W. Cran, and Mr. D. J. Scourfield, for their kindness in allowing me to describe these fossil Arachnids.

The drawings illustrating this paper have been prepared by Mr. Percy Highley and Mr. A. J. Engel Terzi, with the aid of a camera lucida, under my personal supervision.

Order Acari.

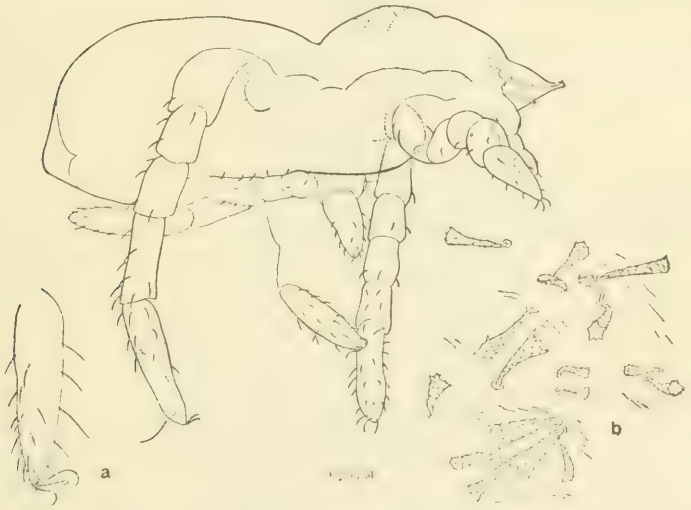
Family Eupodidæ (?).

Protacarus crani, gen. et sp. n.
(Pl. XI. figs. *a* & *b*; text-figs. 1 & 2.)

Body apparently not segmented and moderately elongated. The anterior end can be seen in specimen no. 2 (see list at end of description); there is a little curved process or cone in the median line anteriorly, projecting above the cheliceræ; a few very minute hairs are present on this process and a little further back on each side of the cephalothorax there is a longer hair, possibly plumose, which is perhaps a pseudostigma. Nearer the middle of this specimen there seems to be a transverse line running across the dorsal surface of the body. A number of hairs are present on the body—most of them are short, but some of the posterior ones seem to be longer. A cast skin shows a number of fan-shaped hairs

(text-fig. 1 *b*), but it is a little uncertain whether they belong to this species. It seems probable that the integument of the body was weakly chitinized, for it is wrinkled and cockled in all specimens, the outline being irregular. Apparently the chelicera consists of two segments, the tip of the distal one tapering to a point which seems to have been strongly chitinized, for it is dark in colour; it is difficult to ascertain if there were terminal fingers. *Palp* more slender and much shorter than the legs; apparently it consists of six free segments, and possibly also there may be a fixed proximal segment. *Legs* well developed, being fairly long and apparently having six free segments, the tarsus being the

Text-fig. 1.



Protocarus crani. Sketch of specimen No. 3.

a. Tarsus of leg, greatly magnified.
b. Fan-shaped hairs, greatly magnified.

longest. A number of short hairs, which are usually slightly curved, are present on the legs. In specimen no. 3 the fourth tarsus seems to be furnished with a long dorsal hair, but this is doubtful. Tarsi of legs ending in three terminal hairs shaped like claws but very thin. All four pairs of legs seem to be placed rather close together, the posterior pairs being only a little behind the others. In specimen no. 4 they are situated very close together, but this example is larger than the others and perhaps referable to another species.

Length of body of specimen no. 1, 290μ; of specimen no. 2, ?; of specimen no. 3, 310μ; of specimen no. 4, 440μ.

Many authorities consider the Acari to be a degenerate group of Arachnida; it is surprising therefore to find a mite-like form so early as the Devonian strata. The minute size and apparent lack of segmentation seem to indicate, however, that this fossil form is one of the Acari. Moreover,

Text-fig. 2.

Protacarus crani (?). Ventral aspect of specimen No. 4.

in general appearance this species closely resembles the Eupodidæ, which are considered by Banks to be the most primitive group of mites.

There are six pieces of chert containing examples of this fossil mite. The following is a brief description of them:—

No. 1. A specimen seen sideways, and practically complete; all the legs are visible, except the last one which is

not in this splinter of chert. Fig. *a* (Pl. XI.) is drawn from this specimen. (Cran collection.)

No. 2. A specimen (the type of the species) with the anterior end clearly displayed (see fig. *b*, Pl. XI.).

No. 3. The mite is placed sideways in the matrix, the front end is sectioned, parts being missing. Second and fourth legs well extended (see text-fig. 1).

No. 4. A rather distorted specimen, with the ventral side uppermost. Appendages well displayed, especially the palpi (text-fig. 2).

No. 5. Parts of mite, including the end of the legs. The tarsus of this leg has been sketched (see text-fig. 1 *a*).

No. 6. A number of cast skins of mites in a fragment of chert. Some curious fan-shaped hairs are visible (text-fig. 1 *b*).

It has been possible to examine all this material with a $\frac{1}{6}$ objective and also with a $\frac{1}{7}$ oil immersion objective. Slide No. 5 can be examined with $\frac{1}{12}$ oil immersion, for the fragment of chert is very thin.

Order Araneæ(?). (Pl. XI. fig. *c*.)

Palæocteniza crassipes, gen. et sp. n.

Only a single example of this form has been discovered (Cran coll.), and its structure is difficult to make out, owing to the position of the legs and the crumpled state of the abdomen*. In general appearance it is rather like a trap-door spider. The cephalothorax is obscured by the legs, which have been pressed upwards and are arched. There is a raised structure or hump anteriorly, which may be part of the cephalothorax or is perhaps due to the distortion of some limb. Near the end of the abdomen there is a little detached piece of chitin in the matrix, which, judging from its proportions, might perhaps be the cephalothoracic carapace, presumably having become separated from the rest of the body. The dotted line in the figure labelled "A" represents the outline of this piece of chitin drawn by camera lucida from the detached fragment and placed in its supposed position.

* I have followed Petrunkevitch in retaining the words "cephalothorax" and "abdomen" for the two principal divisions of the body.

Owing to the poor state of preservation of the abdomen, it is impossible to be quite certain whether this is segmented or not. There is, however, at least one definite transverse dividing-line, perhaps representing that one which is present in all recent spiders just in front of the apertures of the anterior pulmonary sacs ; a few short parallel transverse striations are present immediately behind this line in the fossil—possibly they are the beginnings of the lung-books. It is possible that the spinneret-like structures shown in the figure are merely folds of the skin—on the other hand, they may prove to be true spinnerets.

Legs fairly well preserved, being stout and rather short ; the segments seem to be few in number, apparently five (?). The legs, however, are incomplete, so that the full number of segments cannot be ascertained.

Length of body about ·9 mm.

Order Anthracomarti.

Palæocharinidæ, fam. nov.

Body divided into two main divisions, viz., cephalothorax and abdomen, the latter segmented. Tergites of abdomen subdivided into median and lateral divisions; including the prægenital one, there are nine sternites. Two small caudal segments are also present. Palp shaped like a leg, but shorter and with fewer segments. Legs of the normal terrestrial (ambulatory) type. A conical protuberance above the end of the tarsi of the legs, as in the recent scorpions, and also in some of the recent Amblypygi (Pedipalpi).

Palæocharinoides, gen. nov. (Pl. XII.; text-fig. 3.)

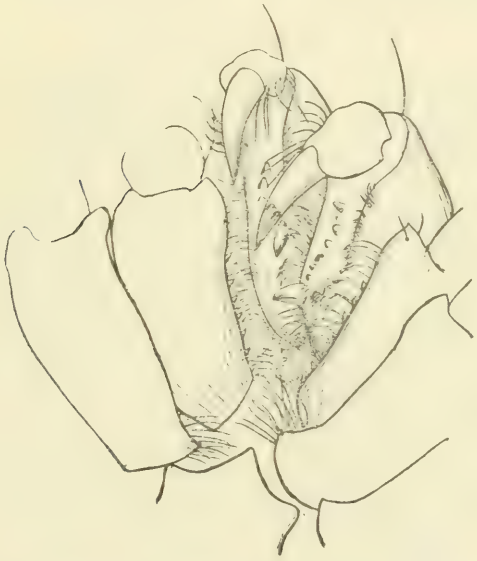
Differs from the allied genus *Palæocharinus* (see p. 462) in having the sternum bluntly pointed posteriorly instead of truncated.

Palæocharinoides hornei, sp. n.

Cephalothorax a little longer than wide. A pair of terminal denticles, or processes, is present at the front end of the upper surface of the cephalothorax as in *Palæocharinus*, but there does not seem to be any more very distinct denticles on the dorsal surface of this anterior part of the carapace, except for one or two on the slight ridges. The curious elongate-oval structures (possibly compound eyes?) are present (one on each side) in this species. As in the species

of *Palæocharinus*, the sternal plate does not reach further back than the anterior end of the fourth coxæ; as mentioned above in the generic description, the sternum is bluntly pointed posteriorly, the posterior margin consisting of two oblique lines meeting to form the blunt tip, the latter being slightly indented. Without including the two minute caudal segments, there seem to be nine abdominal sternites (owing to the position of the fossil in the matrix, the exact number of tergites cannot be ascertained with certainty). Sternites narrow and furnished with very short hairs, distributed as

Text-fig. 3.



Palæocharinoides hornei, sp. n. Chelicera, enlarged.

shown in Pl. XII. First sternite with a median projection; the two following sternites project slightly in the middle also. The genital opening (between the second and third sternites) is not very distinct in this species, but seems to be present. The two minute caudal segments are overlapped by the last of the large abdominal sternites, instead of being terminal as in *Palæocharinus**.

* Minute caudal segments of a similar type seem to be present also in the Carboniferous *Eophrynus prestvici*, but they are very much reduced in size.

Chelicera furnished with seven or eight teeth (text-fig. 3), the first (proximal) tooth being very large, then come three or four very minute denticles running rather obliquely to join a straight row of three medium-sized teeth, of which the two distal ones are slightly larger than the other one. Coxa of palp with sharp conical spinules on its inner surface, presumably stridulatory in function. Coxæ of legs, especially the anterior ones, with the inner anterior angle somewhat curved forwards, forming a slight hook or spur.

This description is based on a single well-preserved example from the Rhynie Chert, collected by the author, and now in the British Museum collection. Total length of body 2·2 mm.

Palæocharinus, gen. nov.

Dorsum (carapace) of cephalothorax strongly convex and not segmented, being fairly wide but narrowed anteriorly; cephalic part considerably narrowed and bearing a number of paired dorso-lateral denticles, of which the anterior ones are sometimes larger than the others. Posterior margin apparently straight or slightly concave. Eyes present*. Sternal plate with the posterior margin truncated. Tergites of the large abdominal segments subdivided into three parts—a large median part and narrower lateral parts. Chelicera of the normal Arachnid type, being very like that of a recent Amblypygous Pedipalp or of a Mygale spider; the fang strong and moving against the main part of the chelicera; edge of the latter grooved and furnished with teeth. Projecting lobe of maxillary palp armed with granules or denticles, and, besides these, a row of curiously modified denticles and hairs may be present on its outer surface, possibly forming part of a stridulatory apparatus (see fig. *h*, Pl. XV.). Palp shaped like a leg, but shorter, apparently consisting of four (five?) segments. Legs of a terrestrial type, being exactly like those of many recent Arachnids; segments seven in number, viz., a coxa or epimeron which is rather closely attached to the body, possibly being partly fused with it, also a bulbous coxa, trochanter, femur, patella, tibia, protarsus, and tarsus—the femur and tarsus being the longest segments. Tarsus provided with a dorsal conical

* In some more recently collected specimens of *Palæocharinus* a pair of small but distinct circular median eyes, apparently with a simple (single) lens, are visible just above the anterior sloping part of the cephalothorax, being placed midway between the two large oval lateral structures; presumably the latter are compound eyes, for a number of minute circular structures, possibly facets, are present on them.

protuberance and excavation near it, as in the recent scorpions and certain of the recent Pedipalpi. A pair of claws are also present.

It seems pretty certain that the genera *Palæocharinoides* and *Palæocharinus* belong to the order Anthracomarti. The general shape of both the main divisions of the body, shape of the sternum, the presence of lateral abdominal spinules, and the subdivision of each tergite into median and lateral sclerites all seem to indicate their relationship to the Carboniferous Anthracomarti. In having a conical protuberance above the distal end of the tarsi, *Palæocharinus* resembles the recent scorpions and also certain recent forms of Pedipalpi (Amblypygi). The presence of two small caudal segments is a peculiar character and necessitates the creation of a new family.

Palæocharinus scourfieldi, sp. n. (Pl. XIII.)

Specimen no. 9 has the cephalothorax practically complete, its shape is shown in fig. *d*; the narrowed anterior (cephalic) portion is furnished with a longitudinal series of denticles on each side, forming the boundary between the narrow flat upper surface and the steep sides of this portion of the carapace; the anterior denticles are the largest. Posterior margin of cephalothorax almost straight. Sternal plate truncated posteriorly and reaching as far backwards as the anterior end of the last coxæ. Chelicera with one very large proximal tooth and two or three smaller teeth nearer the distal end. In the same piece of chert as the type-specimen there is part of another example, presumably of the same species, with one of the cheliceræ turned sideways showing one large and three smaller teeth. Femur of first? leg almost complete, being elongated and furnished with minute granules and slight longitudinal ridges on its ventral surfaces.

Measurements. Length of carapace about 1·75 mm., its width about 1·65 mm. Length of chelicera about ·58 mm.; of femur of first leg ·70 mm. (Specimen collected by the author; type in British Museum coll.)

Palæocharinus rhynienis, sp. n. (Pl. XIV.)

Carapace of this form (specimen no. 10) apparently a little longer than wide, the cephalic part of it being furnished with the usual dorsal processes, the anterior one being rather long and bifurcated; a secondary granule or denticle may be present on the fork. Lower margin of front (*clypeus*) of cephalic part of carapace with the usual little median process,

but it does not bear any granules. A little posteriorly to the cephalic part there is a rather elongated oval structure on each side which is probably a compound eye: on one side of the specimen it is convex, apparently consisting of a single large lens; on the other side it is flat, apparently having collapsed. Posteriorly the middle part of the carapace is rather uneven, being marked by fairly large but shallow pits. Near the middle of the posterior margin there seems to be a pair of tubercles. Sternum small and narrow on the margin; laterally it is provided with short paired processes situated opposite the coxæ of the first and second legs, whilst its posterior margin is practically straight. The coxæ are slightly displaced in this specimen, but it seems as if the sternum did not reach further back than opposite the posterior margin of the third coxæ. Laterally the outer sclerite of the anterior tergites is thickened or compressed, so as to form a kind of edge bearing a little tooth or spinule.

Apparently the first abdominal sternite has a conical process in the middle of its anterior margin. Second sternite with paired median lobes on its posterior margin, and they seem to guard slit-like openings. Anterior margin of third sternite apparently slightly produced in the middle. It is difficult to see the structure of the chelicera, but it seems to have one large proximal tooth and several smaller teeth on its edge. Maxilla with the usual minute triangular spinules on its inner surface; possibly they are merely the thickened bases of hairs. Femur of third leg with several spinules or teeth on its ventral surface, including a large distal one. Trochanter of fourth leg with a fairly large internal process on its inner surface; femur of this leg apparently with only one or two ventral teeth, besides the large distal one; patella, tibia, and protarsus each with a large distal tooth ventrally.

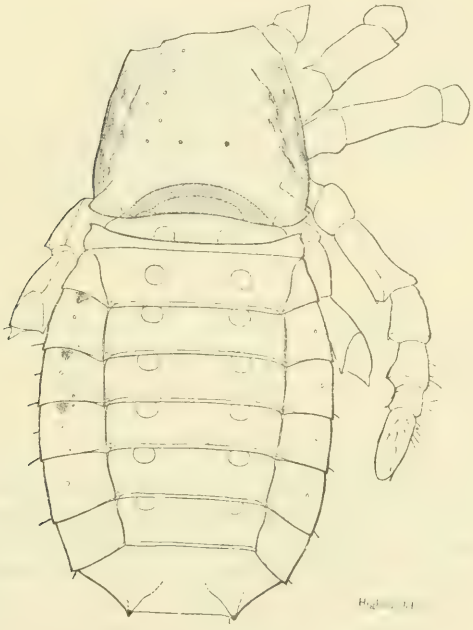
Measurements. Length of carapace about 1·50 mm.; its width about 1·15 mm. Length of chelicera about ·38 mm. Length of trochanter of fourth leg ·27 mm., its height ·24 mm.; length of femur of same leg ·55 mm., its height ·26 mm.; length of patella ·27 mm., its height ·21 mm; of tibia ·27 mm., its height ·22 mm. (Specimen collected by the author; type in British Museum coll.)

Palæocharinus sp. (Text-figs. 4 & 5.)

The greater part of the body of this example is present, and many important details of the structure can be made out. Unfortunately, the anterior end of the cephalothorax and

also the two little posterior segments of the abdomen are missing. The cephalothorax and abdomen seem to be articulated by a ball-and-socket arrangement, the concave surface or socket being formed by the cephalothorax, which is hollowed out to receive the rounded off surface or ball formed by the middle part of the first (prægenital?) segment of the abdomen. Tergites subdivided into the three usual divisions, the large central division of each tergite being

Text-fig. 4.



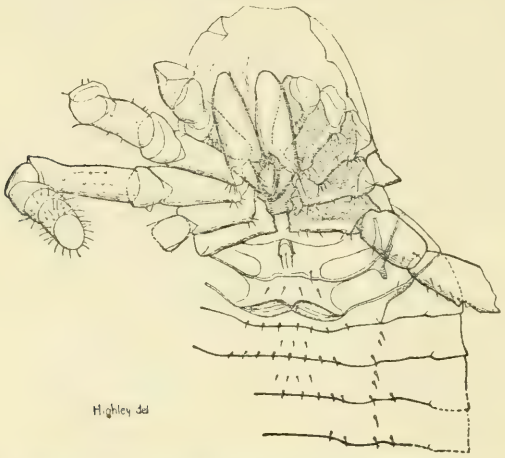
Palæocharinus. Dorsal aspect.

marked with a pair of small oval impressions. There are also some very minute and inconspicuous circles distributed as shown in text-fig. 4. Sternal plate wide and short, its posterior margin is practically truncated. Genital opening very distinct, being situated between the second and third sternites. It is shaped as shown in figure, consisting of a narrow aperture almost divided into two by slight median processes of the two sternites and guarded also by narrow

lip-like edges. A number of short hairs are present on the sternites. Inner anterior angles of coxæ apparently not produced to form curved conical processes, as they are in *Palæocharinoides hornei*.

Length of abdomen about 2 mm. (Specimen collected by E. Browning.)

Text-fig. 5.



Palæocharinus sp. Ventral aspect of same specimen as text-fig. 4.

Palæocharinus calmani, sp. n. (Pl. XV. figs. *a*, *b*, *c*.)

The anterior end of the carapace of the cephalothorax of the specimen (no. 11) of this species is complete on one side, and is furnished with a conspicuous bifid forwardly-directed process or thorn ; a little behind this thorn there is a pair of minute denticles situated a short distance apart from one another. Integument both of body and coxæ ornamented with minute scale-like markings. Chelicera with two large proximal teeth (whereas only one large proximal tooth is present in *P. scourfieldi*) and three smaller teeth, the more proximal of these smaller ones being very slender.

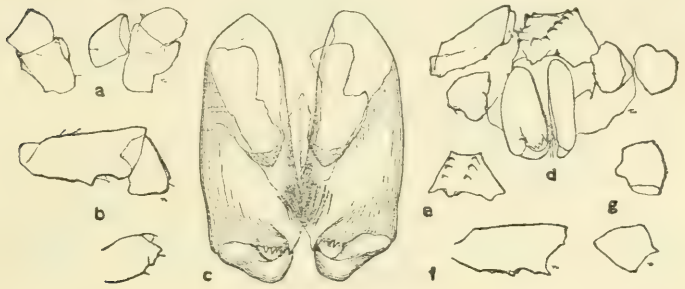
Measurements. Chelicera about ·45 in length (not including claw). (Specimen collected by the author; type in British Museum coll.)

Palæocharinus sp. (Text-fig. 6.)

In specimen no. 12 the lateral spinules arranged in a longitudinal row bordering the narrow, almost flat, dorsal strip, which is the highest part of the cephalic part of the

carapace, are quite sharp. In the middle line of the front (clypeus) there is the usual small process pointing between the cheliceræ, and, as in specimen no. 13, it is furnished with three minute granules, the lowest of them being unpaired and pointed. It is difficult to see the proximal tooth on the edge of the chelicera, but the other teeth are fairly distinct, the middle ones being slender, whilst the two teeth nearer the distal end are a little larger and stouter.

Text-fig. 6.



Palæocharinus sp.

a, *b*, *f*, and *g*, portions of legs; *c*, cheliceræ, greatly enlarged; *d*, anterior end of cephalothorax and cheliceræ; *e*, anterior end of cephalothorax of another example.

Specimen no. 13 (fig. 6 *e*) has spinules very like those present in no. 12, bordering the upper part of the cephalic portion of the carapace, and also shows the little central process of the lower margin of the clypeus. Figure 6 *f* depicts an isolated femur occurring in the same piece of chert and, therefore, possibly belonging to the same specimen. This femur has the usual ventral denticles, including a large distal one.

Palæocharinus kidstoni, sp. n. (Text-fig. 7.)

The description of this form of *Palæocharinus* is based on a section of chert mounted on a slide labelled no. 175 B2, belonging to the series made by Hemingway for Dr. Kidston, and subsequently sent to me by Dr. Cran. Apparently there is no large proximal tooth on the edge of the chelicera, but possibly it has been rubbed off in making the section. A row of four teeth is present near the distal end; they are all placed together, the two proximal ones being very slender, the others stouter. Palp well preserved, especially the three

distal segments, which are furnished with fine hairs. In places the segments of the palp are marked with a fine reticulate scale-like sculpturing. Second? segment with a minute lateral spinule and another ventrally, both being situated distally. There is a section of an abdomen on the same slide, but it is difficult to see the segmentation of the sternites, which seemed fused for a considerable distance (?). Parts of a leg are also present (see fig. 7 *c*), the segments being high and produced ventrally to form distal spinules. Judging by its small size, it seems improbable that this leg belongs to the same specimen as the chelicera and palp described above. Some sectioned segments of a leg also

Text-fig. 7.

Palæocharinus kidstoni, sp. n.

a, chelicera and palp; *b*, section of abdomen; *c* and *f*, fragments of legs; *d*, chelicera, highly magnified; *e*, section of another chelicera found in the same matrix.

occur on this slide, the paired claws being well shown (see fig. 6 *f*).

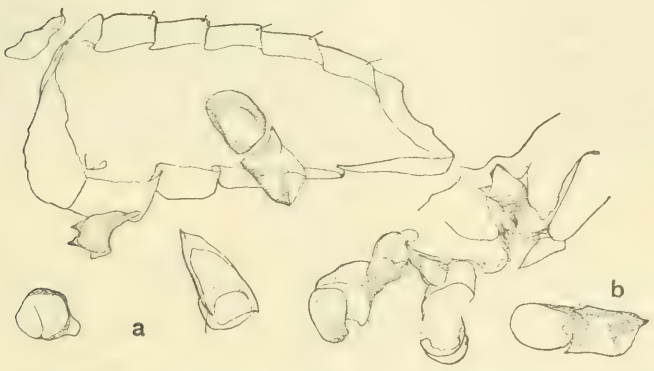
Measurements. Length of chelicera (not including claw) ·54 mm. Length of antepenultimate segment of palp ·31 mm., its height ·22 mm.; length of penultimate segment ·21 mm., its height ·17 mm., length of tarsus of palp about ·32 mm., its height ·16 mm.

Palæocharinus sp. (Text-fig. 8.)

Another slide made by Hemingway for Dr. Kidston shows the abdomen of a *Palæocharinus* sectioned so that the segmentation is clearly visible, seven large segments being

present. The mouth-parts are also sectioned, showing the tufts of hairs of the cheliceræ and part of the maxilla with spinules. Some fragments of legs also occur on this slide ;

Text-fig. 8.



Palæocharinus sp. Section of abdomen, showing the segmentation. *a* and *b*, fragments of limbs.

they end distally in strong pointed processes, and their surface is marked with scale-like markings.

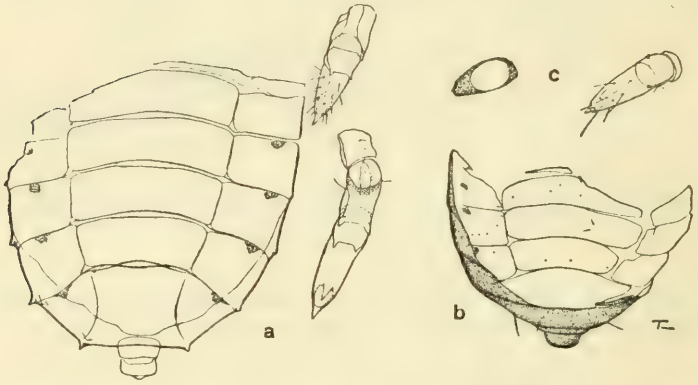
Palæocharinus sp. (Text-fig. 9 *a*.)

This specimen consists of part of the posterior end of the abdomen, together with the terminal segments of two of the legs, collected by Mr. Scourfield. Unfortunately, only the dorsal surface is present, and, owing to its position in the matrix, it has to be examined from the inner side. The segmentation is very clear, however. There are five large tergites, which are of approximately equal length, except the posteriormost one which is a little longer than the others. Each tergite consists of three parts : a large median portion, which is practically rectangular being transversely elongated, and a smaller sclerite on each side. Minute denticles are present laterally near the hinder margin of the posterior tergites. The two caudal segments are very small, and shaped as shown in the figure. From their position it seems certain that the legs situated in the matrix near this portion of abdomen are the third and fourth ones. Three distal segments of the third leg are present and three distal segments, and part of the preceding segment of the

fourth. The penultimate and antepenultimate segments (tibia and protarsus) each have a pair of distal spinules on their ventral surface. Whilst a conical protuberance is present on the dorsal surface of the tarsi, the end of the latter being pointed.

Length of last four segments of abdomen + the two small caudal segments 1·44 mm.; length of third large segment from posterior end ·3 mm., its width 1·50 mm.; length of first caudal segment ·12 mm., its width ·21 mm. (Scourfield coll.)

Text-fig. 9.



Palæocharinus sp. *a*, abdomen and distal segments of posterior legs; *b*, abdomen of another specimen and distal segments of posterior legs (*c*).

Palæocharinus sp. (Text-fig. 9 *b* & *c*.)

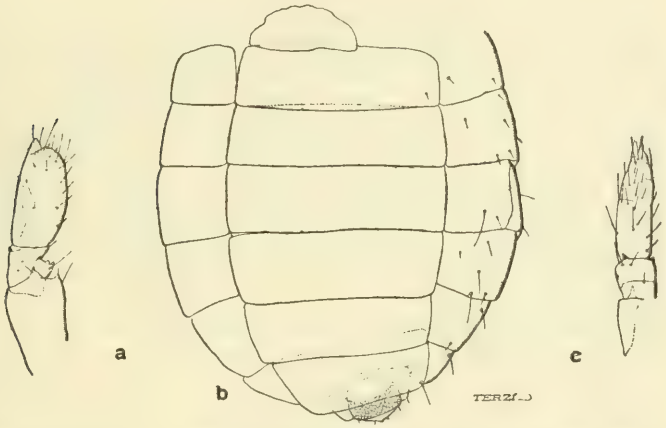
Only the posterior tergites of the abdomen and the distal end of two legs, presumably of the third and fourth of this specimen, are present in the fragment of chert. Lateral sclerites of tergites narrow and apparently without any lateral denticles. Protarsus of legs with only a single very minute denticle on one side distally, instead of the well-developed ones present on each side in the specimen just described above. Tarsus with a well-developed dorsal conical protuberance.

Measurements. Width of abdomen about 1·25 mm., of minute caudal segment ·19 mm. Length of tarsus of posterior leg ·36 mm.

Palæocharinus sp. (Text-fig. 10.)

The example consists of six large abdominal tergites and two little caudal segments. Also some detached fragments of limbs. Lateral sclerites of abdomen rather narrow; lateral spinules are not visible. The anterior of the two little caudal segments seems wider than the other. Tibia of leg rather high, distally it has two dentiform ventral processes. Protarsus very short and with a pair of very short distal denticles ventrally. Tarsus with a large dorsal cone. It is probable that the body and portions of legs of

Text-fig. 10.



Palæocharinus sp. *a* & *c*, distal segments of legs; *b*, abdomen showing tergites and two little caudal segments.

this specimen have been altered somewhat in shape by pressure.

Measurements. Width of abdomen (somewhat crushed) 1·74 mm. Length of one of the larger tergites about ·33 mm.; width of last (small) caudal segment ·22 mm.

Palæocharinus sp. (Plate XV. fig. 6.)

Cephalothorax with short paired processes anteriorly in this form, but they are placed on the lower margin and apparently directed downwards. They seem to be homologous with the projections present near the insertion of the cheliceræ in many recent forms of Arachnida. (Note: In

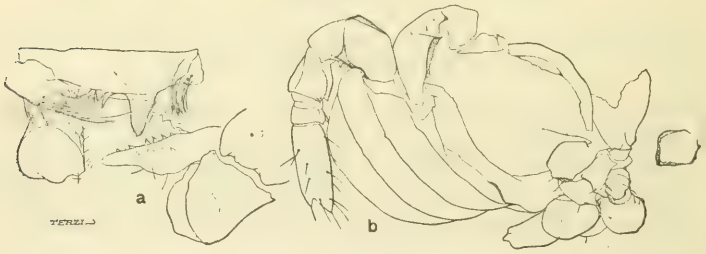
grinding down the fragment of chert in order to make the structure of the chelicera more visible these processes have been accidentally destroyed—they are depicted, however, in fig. 8.) On the outer surface of the maxilla there is a row of hairs, and also another row of flattened conical or triangular setæ, possibly stridulatory in function. Intermingled with these modified setæ there are some slightly plumose hairs. Distal edge of maxilla with two or three minute denticles or granules, and two or more are present on the tip of the maxillary lobe. Tibia and protarsus of leg high, and their ventral surface ends in a pair of spinules or teeth distally.

Palæocharinus sp. (Pl. XV. figs. *d*, *e*, *c*.)

Specimen no. 14 apparently has part of the upper surface of the carapace of the cephalothorax sectioned off and the left side is also slightly distorted, still the general shape of this part of the body is well shown. The usual anterior spinules are well developed. Laterally the cephalothorax seems to be furnished with slight rounded bosses or protuberances. Its posterior margin is somewhat concave, but this may be partly due to distortion. Parts of five of the large abdominal segments of the body are also present, the integument of these segments being ornamented with a fine scaly reticulation.

Measurements. Length of cephalothorax 1·15 mm; its width (at posterior margin) about 1 mm.

Text-fig. 11.



Palæocharinus sp. *a*, part of chelicera and palp; *b*, showing abdominal sternites and one leg.

Palæocharinus sp. (Text-fig. 11 *b*.)

Several of the anterior sternites of this species are present. They do not show any signs of subdivision into median and lateral portions. One of the legs is almost complete and is of the usual type.

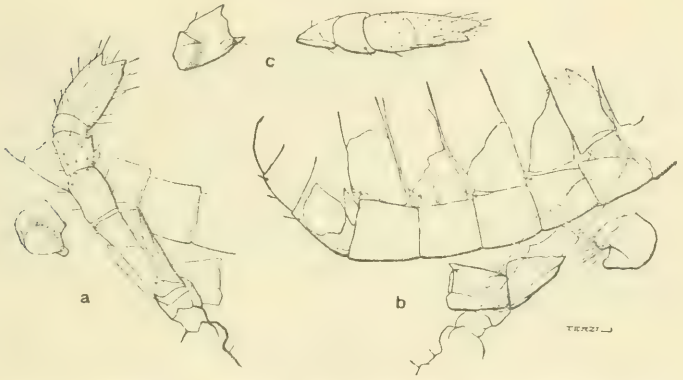
Palæocharinus sp. (Text-fig. 11 *a*.)

Specimen no. 15 consists of a chelicera and a few fragments of the palp. There is one very large and stout proximal tooth and three smaller teeth, the more proximal one of the latter being very slender. It is possible that this chelicera belongs to *P. scourfieldi*.

Palæocharinus sp. (Text-fig. 12.)

This specimen consists of part of the abdomen and also a complete leg, together with a few other fragments of limbs. Portions of six tergites are visible and also one or two ill-defined posterior ones ; the lateral sclerites are narrow, and

Text-fig. 12.



Palæocharinus sp. *a* and *b*, part of abdomen and also an entire leg ; *c*, portions of another leg.

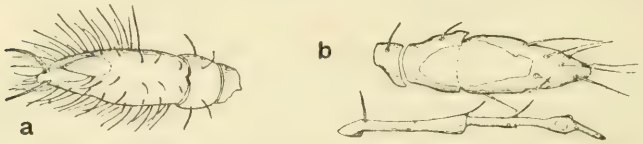
their inner posterior angle projects slightly. One of the maxillary lobes is present lying detached in the matrix ; it is shaped as shown in figure 12 *b*, having a knob-like process, besides the main lobe, the latter being furnished with long hairs and little denticles. Trochanter of leg with a little knob-like protuberance fitting against the coxa (epimeron). Femur fairly long and with a ventral ridge furnished with denticles. Apical spinules of legs rather long. The protarsus short and its distal spinule minute, however.

Palæocharinus sp. (Text-fig. 13 *a*.)

In one fragment of chert (Cran coll.), there is a beautifully preserved tarsus and protarsus of a leg of a *Palæocharinus*. A dorsal cone bearing a single hair is present above the claw and there is the usual hollow below it. Paired claws

well developed, and there is a short straight ventral seta possibly representing the unpaired claw. It will be seen that this leg is of a type met with in recent scorpions and in the Amblypygi.

Text-fig. 13.



a, tarsus of leg of *Palæocharinus*; *b*, distal segments of appendages of Arachnid.

Order ?

In a mounted section of Rhynie Chert prepared by Hemingway, there are the distal ends of two appendages lying side by side. One is obviously the end of a normal leg of an Arachnid, but the other is curiously modified, the segments (metatarsus and tarsus?) being very slender (text-fig. 13 *b*). Some of the Pedipalpi have the end of the first leg narrowed, but in that order the tarsus is subdivided into from eight to very numerous false joints; whereas in this fossil form, although very slender, the tarsus does not appear to be subdivided.

EXPLANATION OF THE PLATES.

Plate XI.

Figs. a & b. Protacarus crani, gen. et sp. n.
Fig. c. Palæocteniza crassipes, gen. et sp. n.

Plate XII.

Palæocharinoides hornei, gen. et sp. n. *a*, lateral view of cephalothorax; *b*, dorsal view of cephalothorax; *c*, ventral view of entire specimen.

Plate XIII.

Palæocharinus scourfieldi, sp. n. *a*, ventral aspect; *b*, remains of another example in the same matrix; *c*, mandible of the same enlarged; *d*, dorsal aspect.

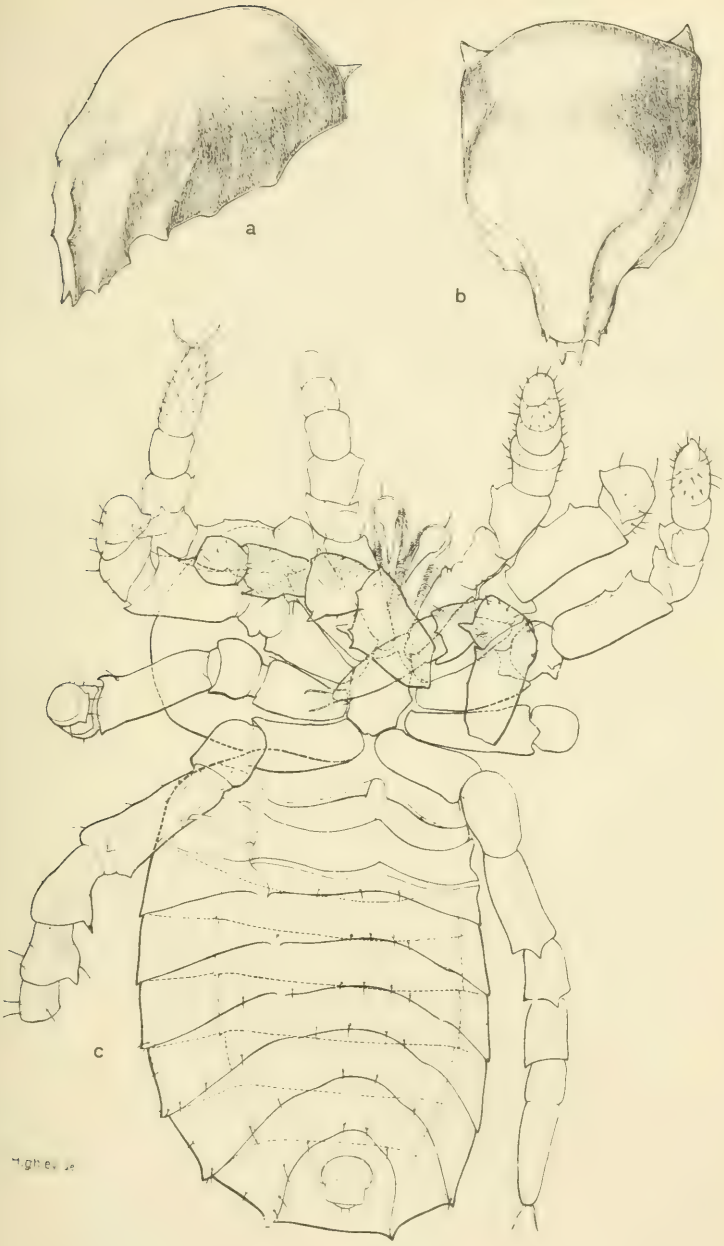
Plate XIV.

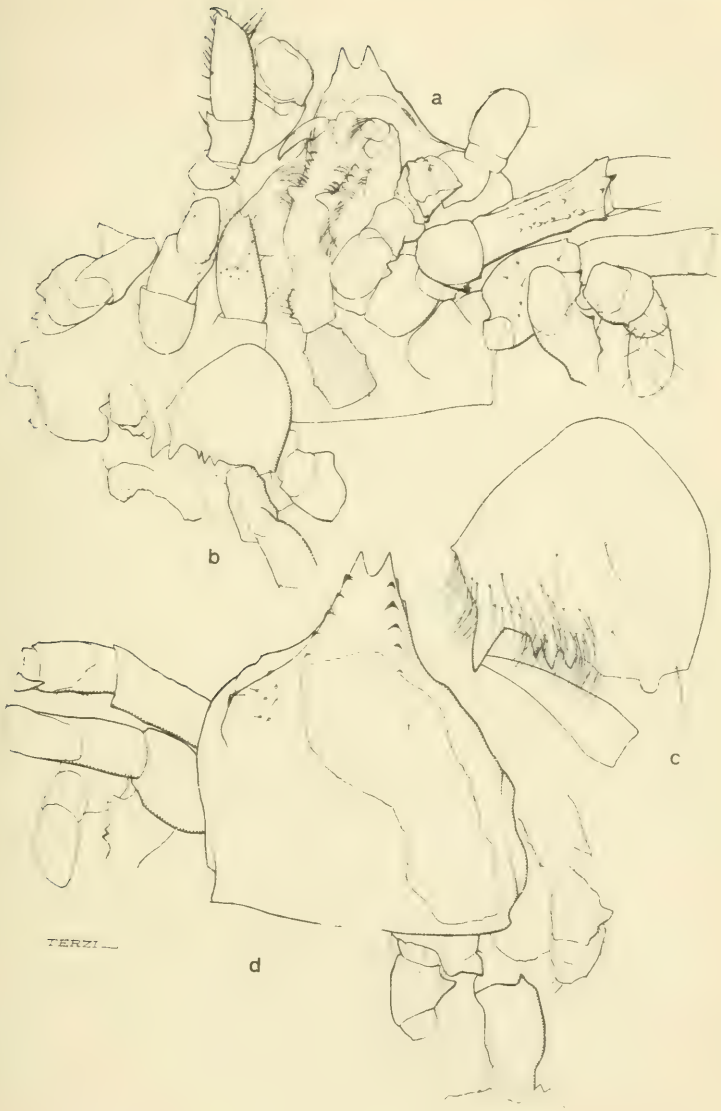
Palæocharinus rhyniensis, sp. n. *a* & *b*, lateral views; *a'*, anterior extremity from above; *c*, ventral view of coxæ, sternal plate and anterior sternites of abdomen; *d*, lateral view of anterior end of abdomen, S i, S ii, S iii, sternites.

Plate XV.

a & *b*, lateral views of *Palæocharinus calmani*, sp. n.; *c*, chelicera of same, greatly enlarged; *d*, *Palæocharinus* sp., from above; *e*, another fragment of same from below; *f*, *Palæocharinus* sp., lateral view; *g*, a leg and coxæ of same; *h*, chelicera of same specimen greatly enlarged, showing stridulatory apparatus.

a
b
A
c
Highley del


a
b
c


a
b
c
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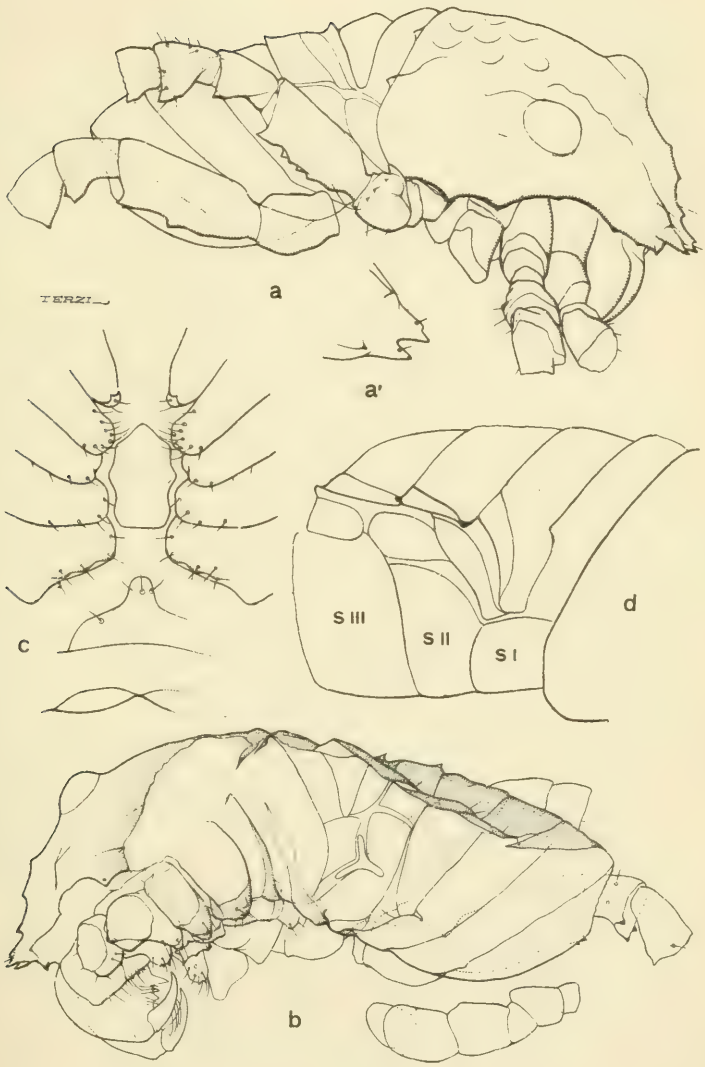
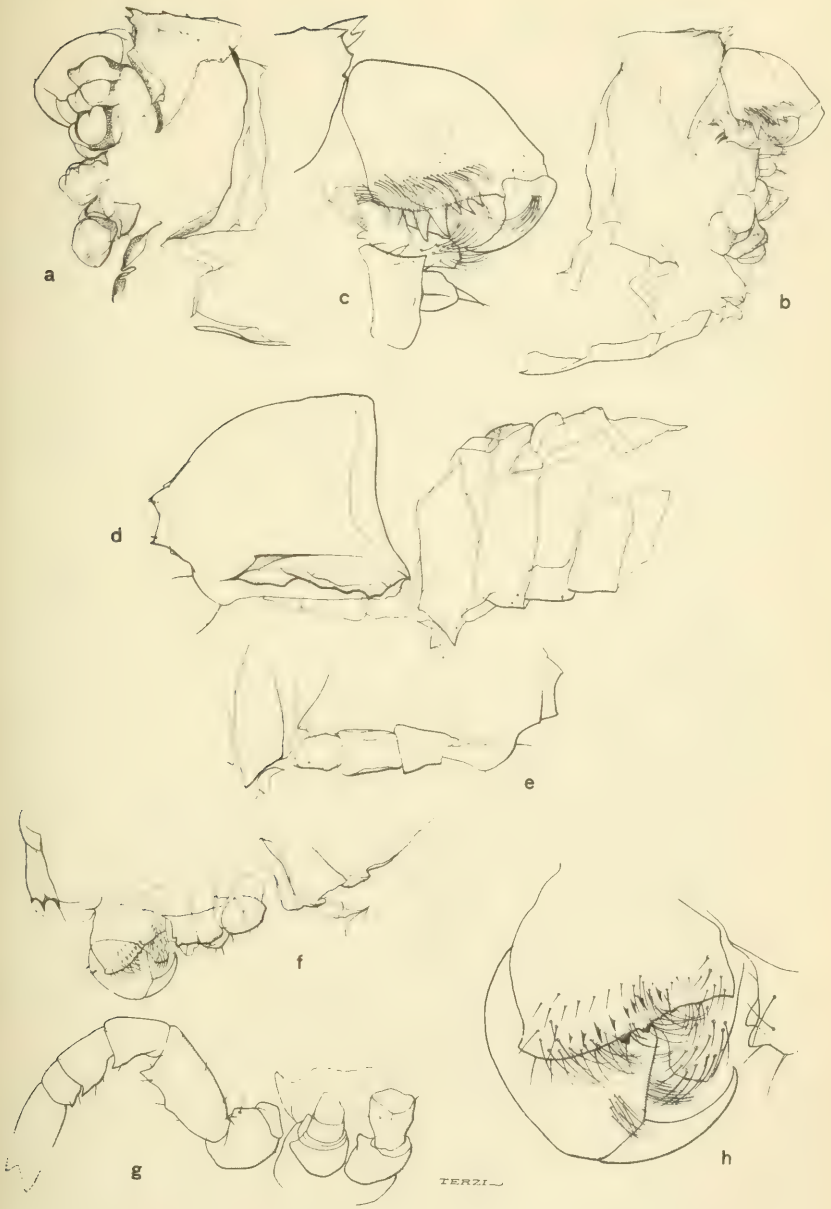
TERZI


TERZI
a
a'
c
S III
S II
S I
d
b


a
c
b
d
e
f
g
h
TERZI

XLVII.—*Notes on the Dipterous Family* Anisopodidæ.

By F. W. Edwards.

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[Plate XVI.]

Having recently been invited by M. Wytsman to prepare a fascicle of the 'Genera Insectorum' on the Anisopodidæ (Rhyphidæ), the writer has studied the material of this family in the British Museum collections, and, through the kindness of Messrs. M. Bezzi, E. Brunetti, J. E. Collin, E. Séguy, and H. Zerny, has examined the types or authentic specimens of nearly all the described species, as well as other undetermined material. During this examination a number of unrecorded species have come to light, and the purpose of this paper is to describe these, and at the same time to differentiate more clearly certain species which have hitherto not been very satisfactorily defined. It is the writer's intention in the 'Genera Insectorum' fascicle to give keys for distinguishing all the known species of the family, including the new ones here described.

Much dispute has recently arisen as to the limits of the family, Keilin and others including within it, on account of larval and pupal morphology, not only *Mycetobia* (till recently regarded as belonging to the Mycetophilidæ), but also *Trichocera* and allied genera, which were formerly placed in the tribe Limnophilini of the Tipulidæ. In the present writer's opinion, the claims of *Mycetobia* to be regarded as a true Anisopodid are unanswerable*, and it is very doubtful whether it should even be placed in a separate subfamily, since it appears to be quite as nearly related to *Olbiogaster* as this genus is to *Anisopus*. The case of *Trichocera* is very much more questionable, and even if the study of the early stages has shown that this is not a true Tipulid, and is in many respects similar to *Anisopus*, it still seems open to question whether it should be included in the same family. However, whether it be regarded eventually as forming a subfamily of Tipulidæ, a subfamily of Anisopodidæ, or a separate intermediate family, it will be both convenient and desirable to deal with it at the same time as *Anisopus*. It is therefore proposed to include it in the 'Genera Insectorum' fascicle, and to set forth the facts relevant to the discussion.

* This conclusion, arrived at by Keilin and the present writer in 1916, has recently been independently confirmed by Max Müller (Zool. Anz. Bd. 53, 1921, p. 297).

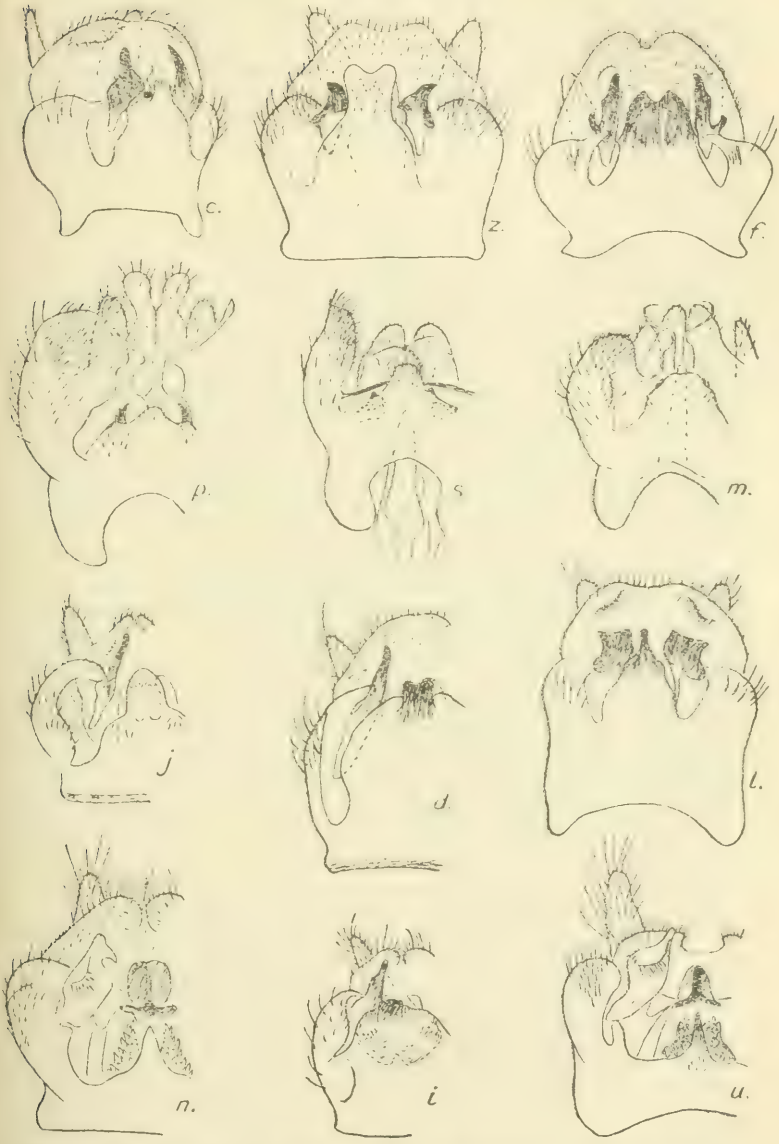
Anisopus fenestralis (Scop.) and *A. cinctus* (Fab.).
(Text-fig. 1, *f* and *c*.)

These species were distinguished by the earlier writers chiefly by the colour of the mesonotum, which in *A. cinctus* was said to be entirely yellowish, while that of *A. fenestralis* has three distinct dark brown or blackish stripes; the wing-markings and other characters being practically alike in the two species. After examining a large number of specimens, I find that we have indeed two common species, but it is impossible to distinguish them by the colour of the thorax, or indeed by any other coloration-character that I have been able to discover. The specimens with light-coloured mesonotum which I have found in various collections labelled *cinctus* are always males of one species—females always have distinct stripes. On the other hand, the males of this species frequently, and of the second species apparently always, have the markings as dark and distinct as those of the female. The two species are, however, very easily separated by the male organs, as shown in text-fig. 1, *f* and *c*. I propose to use the name *fenestralis* for the species shown in text-fig. 1, *f*, which is characterised especially by the broad blackened median part of the ninth sternite, the distinct tooth near the base of the claspers, and the shape of the anal segment; in this species, so far as I have seen, the male thorax is always dark, with distinct stripes; it is very widely spread, perhaps artificially—I have seen examples from Britain and Italy, also (under the name *diversipes* Fitch) from North America. The second species, in which the thorax of the male is variable in colour, may perhaps be legitimately regarded as *A. cinctus*. In this the median part of the ninth sternite is narrow, pale, and pubescent; the claspers are shorter and broader than in *A. fenestralis*, and have no basal tooth (text-fig. 1, *c*). This is also widely spread, as I have seen it from Britain and the Azores.

Anisopus fenestralis, var. *withycombei*, nov.

Structural characters (antennæ and venation) as in *A. fenestralis*, Scop., but differs as follows:—Middle and hind femora almost entirely blackish, only narrowly paler at the base. Wings with a strong smoky tinge, the markings ill-defined, except for the stigmatic area, which is entirely black, without the least trace of the yellow median area which is always present in normal *A. fenestralis*. Area between the stigma and the apical darkening only indistinctly paler.

Text-fig. 1.



Hypopygia of species of *Anisopus*, seen from beneath; the letters are the initials of the specific names: *A. cinctus*, Fab.; *A. zetterstedti*, sp. n.; *A. fenestralis*, Scop.; *A. punctatus*, Fab.; *A. separatus*, sp. n.; *A. marginatus*, Say; *A. javanensis*, sp. n.; *A. divisus*, Brun.; *A. limpidus*, sp. n.; *A. notatus*, Hutton; *A. indivisus*, sp. n.; *A. undulatus*, Lamb.

London: one female taken on a window at Walthamstow, xii. 1922 (*C. L. Withycombe*); presented by the collector to the British Museum.

Since only a single specimen of this remarkable form has been discovered, it seems likely that it is only a melanic variety of *A. fenestralis*, although the differences in colour are much greater than between some forms which are undoubtedly distinct species.

Anisopus zetterstedti, sp. n. (Text-fig. 1, *z*.)

Differs from *A. fenestralis* (Scop.) as follows:—Eyes of ♂ much closer together, the space separating them on the front being only as broad as one facet. Abdomen more extensively reddish (in life), in the ♀ entirely red. Hypopygium differing in many details of structure (compare figures). Hind femora without any trace of a median dark ring. Dark markings of wings rather smaller and rather more clearly defined, the yellow area in cell R_{2+3} therefore proportionately longer. Macrotrichia as in *A. fenestralis*, covering the discal cell and even a large part of the basal cells.

England: Sherwood Forest, 23. ix. 1922 (*F. W. Edwards*); type ♂ and allotype ♀ in the British Museum. Bowness, Westmorland, 23. iv. 1889 (*G. H. Verrall*), 1 ♂. Scotland: Nairn, 31. v. 1908 (*Col. J. W. Yerbury*), 1 ♀. Norway: Turtegrø, 2. viii. 1923, 1 ♂ (*F. W. Edwards*).

This is evidently the species noted, though not distinguished, by Zetterstedt (in his description of *Rhyphus fenestralis*, Dipt. Scand. ix. p. 3437) as having the eyes of the male "minime cohaerentes." His collection, however, as I have recently ascertained, does not contain any examples.

Anisopus limpidus, sp. n. (Text-fig. 1, *l*.)

♂. *Head* blackish, dusted with grey. Eyes small, well separated, the facets all about equal size. Front almost twice as broad as the slightly prominent ocellar tubercle. Antennæ with the scape brownish, flagellum black, all segments, except the first few, about twice as long as broad. Palpi blackish. *Thorax* ochreous, the mesonotum with three dark brownish stripes, dusted over with grey. Bristles pale. *Abdomen* ochreous with yellowish pubescence, segments 6 and 7 mostly blackish. Hypopygium as figured—note especially the short, truncate, black claspers and the narrow black median projection of the ninth sternite. *Legs* uniformly light ochreous, hind femora and tibiæ not darkened

at the tips. *Wings* almost entirely clear ; cell R_1 pale yellow, with a small light brown stigma near the tip ; slight dark clouds on the cross-veins, and a small dark cloud on the upper part of the apex of the wing, only indistinctly extending into cell R_5. Macrotrichia rather dense over practically the whole membrane, even in the basal cells. Halteres ochreous.

Wing-length 5 mm.

Austria : Gastein, 18. vii. 1907, 2 ♂ (*Oldenberg*, Collin Coll.).

Since the above was written, Mr. Oldenberg has been so good as to present to the British Museum 2 ♂ 2 ♀ of this species. The ♀ differs from the ♂ (as usual) in having the wing-markings rather more pronounced and the abdomen uniformly light. Mr. Oldenberg writes :—"The species is not rare in the mountains of Central Europe. At Gastein, abundant on a steep and damp mountain-side. I have also found it at S. Martino di Castvozza, at Ratzes (Dolomiten), in the Kohlbachtal (Tatra, numerous), in the Glatzer Gebirge (Silesia), and in the Bavarian forest at Arber."

Anisopus pulchricornis (Brun.).

Only the female of this species has been described. There is a male in the Indian Museum from Ghumti, Darjiling District, 4000 ft. (*F. H. Gravely*). This sex is remarkable for the structure of the eyes. These are extremely large, making the head distinctly broader than the thorax ; the facets of the upper half or rather more are very large, those of the lower part small and darker in colour ; the division between the two areas is rather sharply marked and is indicated by a slight furrow. Prof. de Meijere informs me that the eyes in his type of *Rhyphus flavipes* have exactly the same structure, and, moreover, his figure of the wing of this species is too pale, so that *A. flavipes* (de Meijere, Dec. 1911) would seem to be synonymous with *A. pulchricornis* (Brunetti, July 1911). The very similar *A. maculipennis* (van der Wulp) differs in having the eyes normal.

In *A. pulchricornis* the third (first flagellar) segment of the antennæ is clear yellow, cylindrical, and nearly twice as long as broad, without any trace of a fovea on the outer side.

Anisopus foveatus, sp. n.

♀ . Resembles both *A. maculipennis*, v. d. W., and *A. pulchricornis,* Brun., rather closely, differing from the former in the complete absence of a black ring on the hind femora,

and from the latter in the absence of a dark cloud in the middle of the subapical clear space on the costa, also from both in having the first flagellar segment shorter (scarcely longer than broad); largely dark in colour (at least on the upper surface) and provided on the outer side with a conspicuous shallow circular pit (fovea). Flagellar segments 2 and 3 dark above, yellow beneath; 4 entirely black; 5 yellow; 6 yellow with black tip; 7 and 8 black; 9 and 10 yellow; 11–14 black; 15 white. Wings with rather dense macrotrichia over practically the entire surface. Basal half of upper basal cell with only a very faint dark patch; basal two-thirds of discal cell all dark; wings otherwise as in *A. maculipennis*.

Wing-length 5·5 mm.

Ceylon: Madulsima, xi. 1908 (*T. B. Fletcher*).

Type ♀ in the British Museum. A second ♀ is in the Indian Museum from Ceylon (*Annandale*, no exact locality), while the specimen from Peradeniya recorded by Brunetti as *R. maculipennis* is, probably, also this species. In Mr. Senior-White's collection are several specimens from Ceylon, both sexes being represented. The male has eyes similar to those of *A. pulchricornis*, but not quite so large, the upper area of large facets being considerably less than half the eye. It differs from the female in having no antennal fovea.

Anisopus malayensis, sp. n. (Pl. XVI. fig. 7.)

♀. *Head* blackish, slightly dusted with grey. Antennæ and palpi black. First flagellar segment about half as long again as broad, 2–9 each as long as broad, 10–13 gradually increasing in length, 14 slender, nearly as long as 12 and 13 together. *Thorax* rather dark brown. Mesonotum tinged with greyish ochreous, with the usual three dark brown stripes, the middle one undivided and running the whole length. Scutellum dull black in the middle. Postnotum shining. *Abdomen* dark brown, the first tergite largely ochreous, the posterior borders of the following segments narrowly pale. *Legs*: front coxæ, femora, and tibiæ ochreous, tarsi dark. Mid and hind coxæ dark. Mid-tibiæ and femora narrowly dark at the tips. Hind femora with a narrow dark tip and a very broad median dark ring. Hind tibiæ broadly dark at the tip. *Wings* much as in *A. fenestralis*, but the tip darker, without pale areas in cells M_1 and M_2, and as in *A. javanicus* the darkening is deeper against the outer edge

of the subapical pale spot. Macrotrichia numerous on apical half of wing; very few in discal cell. Halteres ochreous.

Wing-length 5 mm.

Malay Peninsula: Pahang, Gunong Tahan, 5500 ft., 2–10. xii. 1922 (*H. M. Pendlebury*).

Co-types, 4 ♀, in British Museum and Malay States Museum.

The conspicuous dark ring on the hind femora and the slight differences in wing-markings seem sufficient to distinguish this species from *A. indivisus*, sp. n.

Anisopus javanicus, sp. n. (Text-fig. 1, *j*.)

Closely resembles *A. fenestralis* (Scop.), differing as follows:—Eyes of ♂ touching for a long space, the facets of the lower third somewhat smaller than the others. Hypopygium of different structure, as shown in the text-figure. Hind femora without a trace of a median dark ring. Wings with the ground-colour a little more yellowish, and with the macrotrichia distinctly less numerous, the discal cell and the bases of cells M_1 and M_2 being practically bare in both sexes. Markings practically as in *A. fenestralis*, except that the inner edge of the apical dark patch is slightly but distinctly darker below *Rs* than it is at the costa.

Java: Mt. Pangrango, 3000 m., vi. 1919.

Type in the British Museum, paratypes ♂ ♀ in the British Museum and the Buitenzorg Museum.

From the Himalayan *A. indicus* (Brun.), which has identical wing-markings, this species differs in the more broadly contiguous eyes, in the structure of the hypopygium, and in the absence of the ring on the hind femora.

Anisopus indicus (Brun.).

Rhyphus fenestralis, var. *indicus*, Brunetti, Rec. Ind. Mus. iv. p. 261 (1911).

Apart from the distinction in wing-markings mentioned by Brunetti, this differs from *A. fenestralis* (Scop.) in the structure of the male eyes and hypopygium, and in the much scantier macrotrichia on the wing-membrane. The eyes just touch for a short distance, and the facets of the upper part are somewhat larger than those of the lower. The hypopygium differs in many details—in particular, it may be noted that the clasper of *A. indicus* is forked near the tip. As in *A. fenestralis* the hind femora have a more or less distinct brown ring in the middle.

In view of the above-mentioned differences, I think there can be no doubt that this form should rank as a distinct species.

Anisopus indivisus, sp. n. (Text-fig. 1, *i.*)

Head black, dusted over with grey. Eyes of the ♂ touching for a long space; facets on the lower half distinctly smaller than those of the upper half, but the line of division not sharply marked. Eyes of the ♀ separated by about twice the width of the ocellar triangle. Antennæ slender, entirely black, flagellar segments approximately equal, about twice as long as broad, in the ♀ somewhat shorter. Palpi black. *Thorax* dull reddish brown, pleura somewhat darker, the scutum with three slightly darker stripes, the middle one not divided. Bristles black. *Abdomen* dark brown, posterior borders of segments narrowly pale. Hypopygium as figured; resembling somewhat that of *A. divisus* (Brun.), but the internal parts very different; a large spiny structure lies immediately below the ninth sternite, which is hardly represented in *A. divisus*. *Legs* ochreous-brown. Hind femora with scarcely a trace of the median dark ring, and with only a very slight darkening at the tip. Hind tarsi slender, first segment barely twice as long as second. *Wings* with markings of the *fenestralis* type, and closely resembling those of *A. divisus* (Brun.). Apical darkening slight, but extensive, and almost obliterating the pale areas in cells M_1 and M_2. Macrotrichia more numerous than in *R. divisus*, many being present in the discal cell and in cell Cu_1, even in the ♂.

Wing-length 5 mm.

Eastern Himalayas: Darjiling, 7000 ft., 7–8. viii. 1909 (*C. Paiva*).

Type ♂ and allotype ♀ in the Indian Museum.

The specimens have been referred to by Brunetti (Fauna Brit. Ind., Dipt. Nem. p. 558) as probably a variety of *A. divisus*, but they are certainly distinct from that species, on account of notable differences in thoracic markings and hypopygial structure.

Anisopus separatus, sp. n. (Text-fig. 1, *s.*)

Closely allied to the European *A. punctatus* (F.), differing as follows:—Palpi brownish ochreous, not black. Eyes of the male separated by nearly the width of the large ocellar tubercle. Hypopygium different in detail, as shown in the figures. First segment of hind tarsus of male quite slender

(not slightly swollen) and scarcely more than twice, instead of practically three times, as long as the second segment.

Eastern Himalayas: Kurseong, 5000 ft.

Type ♂, 10–26. ix. 1909 (*Lynch*); allotype ♀, 9. ix. 1909 (*N. Annandale*): both in the Indian Museum.

This is the species determined by Brunetti as *A. punctatus* (F.), but it differs obviously at the first glance by the well-separated eyes of the male.

Anisopus notatus (Hutton) and *A. undulatus* (Lamb).

In my recent paper on the crane-flies of New Zealand, I have sunk *A. undulatus* (Lamb) as a synonym of *A. notatus* (Hutton). Since writing this, however, I have received a large number of specimens of *Anisopus* from various correspondents in New Zealand, and a study of the new material shows that there are in the Colony two closely allied species included under *A. notatus*, both common and widely distributed. It is evident that both these species were included by Hutton in his conception of *A. notatus*, since the two co-types presented by him to the British Museum are females of each. One of these species, as I have said, appears to be identical with *A. undulatus*, and it will therefore be convenient to restrict the name *notatus* to the other, which would otherwise be nameless. The two species differ as follows:—

A. notatus (Hutton) (text-fig. 1, *n*, and Pl. XVI. fig. 9).—Scape of antennæ generally ochreous. Mesonotum with the ground-colour lighter than in *A. undulatus*, the stripes sometimes obsolete; scutellum generally blackish. Subapical pale spot of costa rather small, conspicuously white, and more or less distinctly separated from the pale markings in cells M_1 and M_2 by a dark band. Hypopygium as in text-fig. 1, *n*.

A. undulatus (Lamb) (text-fig. 1, *u*, and Pl. XVI. fig. 8).—Scape of antennæ dark brown to blackish. Mesonotum darker, sometimes almost entirely blackish brown. Subapical pale spot larger than in *A. notatus*, not conspicuously white, and connected with the pale markings in cells M_1 and M_2. Hypopygium as in text-fig. 1, *u*. It is of interest to note that the nearest ally of this species appears to be *A. fusci-pennis* (Macq.) of Cape Horn.

Anisopus ornatus, sp. n. (Pl. XVI. fig. 1.)

♀. *Head* grey behind, greyish ochreous on the front and face; a dark spot over the ocelli, continued forwards as a narrow stripe nearly to the base of the antennæ. Front as

broad as one eye, not narrowed below ocelli. Palpi and antennæ entirely black; first six flagellar segments hardly longer than broad, next two rather longer (rest missing). *Thorax*: mesonotum light reddish, with two narrow admedian black lines running its whole length, and two more, less distinct, near the lateral margin and abbreviated in front; margin of mesonotum paler ochreous, especially posteriorly. Scutellum blackish. Postnotum blackish in the middle, ochreous at the sides. Pleura ochreous with darker mottling. *Abdomen* yellowish with darker mottling, and narrow blackish apical margins to most of the segments (dark markings perhaps due to discoloration). *Legs* ochreous, tarsi darker, tips of middle femora and tibiæ narrowly dark brown, of hind femora and tibiæ more broadly so; hind femora also with a dark brown median ring. *Wings* hyaline, with an elaborate pattern of brown spots as shown in the figure; most noteworthy are the series of small spots in cells R_{4+5}, M_1, M_2, and Cu_1. Macrotrichia numerous on the apical half of the wing, and occurring sparingly along the margins of cells Cu_2 and *An*. Cell M_1 rather broader at the base than M_2. Halteres ochreous.

Wing-length 6·5 mm.

Venezuela (Lindig, 1864).

Type in the Vienna Museum.

Allied to *A. marmoratus*, sp. n., but differing in many details of thoracic and wing markings, the wings being more elaborately spotted than in any other known species.

Anisopus marmoratus, sp. n. (Pl. XVI. fig. 2.)

♀. *Head* black, with a little black hair on the vertex; frons somewhat dusted with grey. Antennæ and palpi entirely black. Flagellum slender, basal flagellar segments as long as broad, the rest gradually longer and more slender, so that the last four or five are about twice as long as broad; terminal hardly longer than the penultimate. *Thorax* light brown, scutellum, postnotum, and upper part of pleura darker. Mesonotal bristles black, the finer hairs scanty, yellowish. *Abdomen* mostly blackish, the bases of the segments yellowish, especially at the sides. *Legs* ochreous, tips of mid and hind femora and of hind tibiæ black; hind femora also with a rather broad brown ring in the middle. *Wings* with macrotrichia over the apical half, very few in the discal, basal, and axillary cells. Ground-colour pale grey; brown markings as in the figure; the space between the two dark portions in cell R_1 yellow.

Wing-length 5 mm.

Colombia: Bogota, 1918 (*Fr. Appolinaire-Marie*).
Type in Paris Museum.
Easily distinguished from all the other Neotropical species by the eight separate transverse brown spots in the middle of the wing.

Anisopus annuliferus, sp. n. (Pl. XVI. fig. 3.)

♀. *Head* black, rather strongly dusted over with grey. Front about half as broad as one eye, not narrowed below ocelli. Palpi and antennæ black. Basal flagellar segments a little longer than broad, gradually lengthening and becoming somewhat more slender, so that the last few segments are nearly twice as long as broad. *Thoraæ* uniformly ochreous-brown, bristles black. *Abdomen* with the first segment yellowish, dark brown at the sides, following segments darker, each with a narrow transverse black line just before the apex. *Legs* ochreous, tarsi darker; femora and tibiæ of mid-legs slightly, of hind legs conspicuously, blackened at the tips; hind femora also with a broad dark brown median ring, and hind tibiæ slightly darkened at the base. *Wings* with a conspicuous dark brown pattern as in the figure; in particular, it may be noted there is a sharply defined fascia or series of spots extending from the outer part of the stigma across cells R_{1+5}, M_1, and M_2, the portion of this fascia in cell R_{4+5} being pushed out slightly towards the apex of the wing. Dark stigmatic area broadly interrupted with yellow in the middle. Apical three-fourths of wing with rather dense macrotrichia. Cell M_1 broader at base than cell M_2. Halteres ochreous.
Wing-length 5 mm.
Brazil: S. Paolo (*Barbiellini*).
Type in the collection of Prof. M. Bezzi.
This is nearly allied to *A. annulipes*, Edw., but appears distinct. M. E. Séguy has kindly compared a photograph of the wing of *A. annuliferus* with the type of *A. annulipes* and reports the differences as follows: "Le type d'*A. annulipes* a l'aile plus clair, les taches moins sombres, moins étendues, et celle de la partie apicale de l'aile n'a pas la même forme. L'aile est plus allongée chez le type de *annulipes*, elle est aussi moins velue." Further the spot in cell R_{4+5} is nearer instead of further from the base of the wing than the spot crossing cells M_1 and M_2.

Anisopus pauperatus, sp. n. (Pl. XVI. fig. 5.)

♀. *Head* black, rather strongly dusted over with grey. Front not as broad as one eye, but not narrowed below ocelli.

Palpi black. Antennæ black, scape rather lighter. Basal flagellar segments hardly longer than broad ; the last five or six more slender and about twice as long as broad ; terminal longer than penultimate. *Thorax* uniformly ochreous, bristles black as usual. *Abdomen* apparently ochreous (discoloured). *Legs* ochreous, the hind femora not darkened at the tip and without any trace of dark median ring. *Wings* with the markings unusually faint. Dark area of stigma only indistinctly interrupted with pale in the middle. Wing-apex broadly darkened. A dark bar, separate from the dark apex, crosses cells R_{4+5}, M_1, and M_2 well before the middle of cell R_{4+5}. Cross-veins only slightly bordered with dark. Macrotrichia present on the apical half of the wing, but rather scanty ; scarcely any in cell Cu_2. Cell M_1 broader than cell M_2 at the base. Halteres ochreous.

Wing-length 4·8 mm.

Venezuela ("Kad. 857").

Type in the Vienna Museum.

Anisopus tibialis, sp. n. (Pl. XVI. fig. 4.)

♀. *Head* as in *A. marmoratus*, except that the flagellum is rather stouter and its terminal segments are less than twice as long as broad. *Thorax* as in *A. marmoratus*, but the mesonotum with indications of five narrow dark stripes, and the sides rather broadly paler. *Abdomen* missing. *Legs* ochreous ; tips of mid and hind femora rather broadly dark brown ; hind femora also with a broad dark brown ring occupying the middle half; hind tibiæ ochreous, with a narrow whitish ring at the base, followed by a rather broad but ill-defined dark brown ring, tip also broadly dark brown. *Wings* with the macrotrichia somewhat more numerous than in *A. marmoratus* ; markings almost as in *A. fenestralis*, but the upper basal cell with two distinct dark areas, as in most of the Neotropical species. Halteres yellow.

Wing-length 6·2 mm.

♂. Resembles the ♀ in coloration, except that the yellowish preapical spot on the costa is rather smaller. Eyes touching. Ocellar tubercle very large and prominent. First few abdominal segments ochreous, darker posteriorly ; remainder all dark.

Mexico: "Région montagneuse des environs de Toluca," 1908 (*L. Diguet*), 1 ♀, type in Paris Museum.

Costa Rica (*Paul Serre*, 1920), 1 ♂ in Paris Museum.

This species belongs to the same group as *A. guttatus*, Schin., which seems to develop a number of fairly distinct

local forms. It is most nearly allied to *A. infumatus*, Knab (Trinidad), but seems distinct by the leg-markings and the lighter wings.

Anisopus albicornis, sp. n. (Pl. XVI. fig. 6.)

♀. *Head* blackish, somewhat dusted with grey, especially on the face and front. Front scarcely narrowed below ocelli, about half as broad as one eye. Palpi entirely blackish brown. Antennæ with the scape ochreous; flagellum black, except for the outer two-thirds of the last segment, which are whitish ochreous. Flagellar segments all approximately equal in length and thickness, the terminal scarcely longer than the penultimate. *Thorax* dark brownish, without distinct markings; scutellum blackish at tip and with the usual two divergent black bristles. *Abdomen* brownish ochreous, with the usual dark mottling in the middle and at the sides, and narrow blackish hind margins to the segments. *Legs* ochreous, tarsi darker; hind femora black at the tip and with traces of a dark median ring. *Wings* much as in *A. guttatus* and allies; subapical pale spot small and without yellow tinge; cell M_1 much narrower at the base than cell M_2 and almost pointed. Macrotrichia rather dense on outer two-thirds of wing and towards margin of cells Cu_2 and *An*.

Wing-length 5·3 mm.

Jamaica: Cinchona, vi. 1889 (*W. Fawcett*).

Type ♀ in the British Museum.

This is apparently most nearly allied to *A. dolorosus* (Williston) from St. Vincent, which differs in the entirely black and somewhat tapering flagellum, front considerably narrowed below ocelli, lighter thorax, cells M_1 and M_2 equal at base, etc.

Anisopus luteatus, sp. n.

♀. Differs from *A. guttatus*, Schin., as follows:—Scutellum ochreous like the rest of the thorax. Abdomen ochreous-brown, the hind margins of the segments not black. Hind femora blackened only at the extreme tip, and without trace of median dark ring. Wings with a more decided yellow tinge in the ground-colour; discal cell almost entirely clear; subapical pale spot larger and extending more across R_{4+5}; cell M_1 much narrower at the base than cell M_2.

British Guiana: Mt. Roraima, 8600 ft. (*J. J. Quelch*).

Co-types, 2 ♀, in the British Museum.

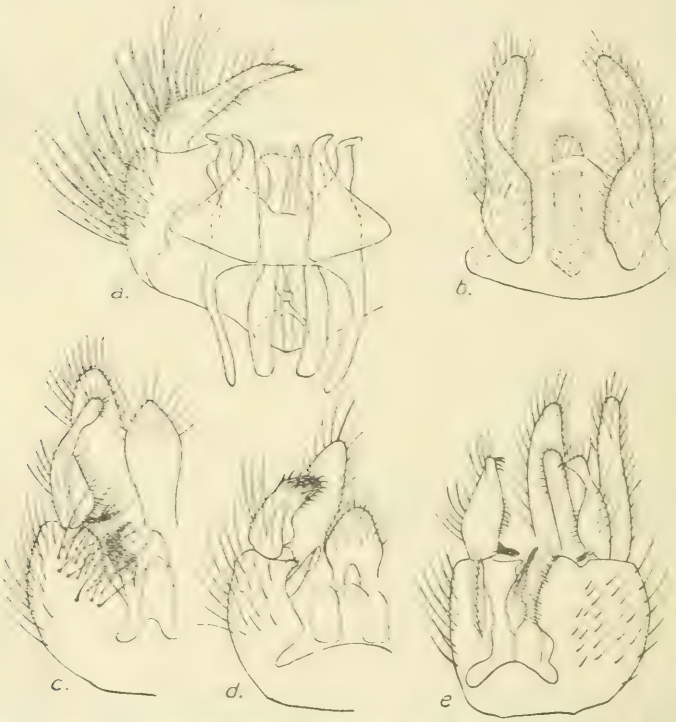
Anisopus marginatus Say. (Text-fig. 1, *m*.)

This has been quoted as synonymous with the European *A. punctatus*. I am indebted to Prof. Bezzi for specimens from Montreal, which show that it is really distinct. Though externally very much like *A. punctatus*, there are small but constant differences in the hypopygia.

Lobogaster philippii, Schin. (Text-fig. 2, *a* and *b*.)

I am indebted to Dr. H. Zerny of the Vienna Museum for the loan of the type of this species, and to Mr. J. E.

Text-fig. 2.



Hypopygia of *Lobogaster* and *Olbiogaster*: *a*, *L. paradoxus*, Phil., from above, anal segment removed and shown at *b*; *c*, *O. polytaeniatus* (Big.); *d*, *O. flavicoxa*, sp. n.; *e*, *O. africanus*, Edw., seen in a morphologically ventral view.

Collin for the loan of several additional specimens from Chile in Bigot's collection. After examining this series, I feel practically certain that the species is the same as Philippi's *L. paradoxus*. Philippi's type doubtless had its

antennæ broken, as have most of the examples before me; this would account for the chief discrepancy between the two descriptions, the other supposed differences being in small details of colour which are evidently subject to variation. *Lobogaster* agrees in almost all its main features with *Olbiogaster*, differing chiefly in the long dense hair on the face and eyes, and in the much larger size. As in *Olbiogaster*, the flat lateral expansions of the abdominal segments occur in the males only, the females being without them. I give herewith text-figures of the hypopygium of this species, taken from one of Bigot's specimens, which was compared with Schiner's type.

Olbiogaster africanus, Edw. (Text-fig. 2, *e*.)

In describing this species (Ann. & Mag. Nat. Hist. ser. 8, xvi. p. 503, 1915), I mentioned several specimens from Obuasi, Ashanti, and one from Oshogbo, S. Nigeria. I now find that there were two species in the series, the male from Oshogbo and one female from Obuasi differing from the type. The diagnostic characters of *O. africanus* are the following:—Prothoracic lobes clear yellow. Front coxæ yellow, more or less darkened on the basal half. Hypopygium (text-fig. 2, *e*) with the tenth sternite long, finger-like, rounded at the tip; side-piece with a projecting ventral flap fringed with long hairs; clasper only slightly hairy at tip, and with basal spine inwardly directed.

Additional specimens of this species have been received from Drs. A. Ingram and J. W. Scott-Macfie, who obtained them at Aburi, Gold Coast, from larvæ living in rot-holes in trees. The larvæ and pupæ rather closely resemble those of *Anisopus*.

Olbiogaster polytæniatus (Bigot). (Text-fig. 2, *c*.)

I am indebted to Mr. J. E. Collin for the loan of Bigot's type of *Rhyphus polytæniatus*, a female from Assinia. It is an *Olbiogaster*, rather closely resembling *O. africanus*, but differing in having the prothoracic lobes and all the coxæ blackish. The male and female from Oshogbo and Obuasi referred to above also have these parts blackish, and are doubtless this species. The hypopygium (text-fig. 2, *c*) has the tenth sternite long, somewhat spoon-shaped, with a fringe of hairs round the pointed tip; side-pieces without ventral flap but with a patch of stiff hairs; clasper hairy at tip and with basal spine.

Additional specimens of this species have been received from Aburi, Gold Coast (*W. H. Patterson*).

Olbiogaster flavicoxa, sp. n. (Text-fig. 2, *d*.)

Differs from *O. africanus*, Edw., as follows:—Prothoracic lobes black. Abdominal tergites 1–4 yellow at the base as well as on the apical margin. Coxæ and trochanters all clear yellow. Slight dark clouds at the base of *Rs* and on *m*. Discal cell rather shorter, scarcely over twice as long as its greatest width; *r–m* rather further (nearly twice its length) from the tip of *Rs*. Hypopygium (text-fig. 2, *d*): tenth sternite short, rounded at tip, hairy. Side-piece without ventral flap or hair-patch. Clasper rather short, without basal spine, apical half fringed with short black spines.

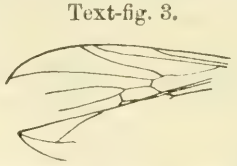
San Thomé (*H. J. Snell*).

Type ♂ (unique) presented to the British Museum by the Imperial Bureau of Entomology.

Platyura fittoni, Brodie. (Text-fig. 3.)

In a recent number of the periodical (Ann. & Mag. Nat. Hist. ser. 9, vol. ix. 1922, p. 269) I published a note on this Jurassic fossil, with a figure of the venation in so far as I could make it out. Since then I have re-examined the type, and after studying it closely I find that my previous figure

Text-fig. 3.



Olbiogaster ("*Platyura*") *fittoni* (Brodie).
Wing of type.

was inaccurate in some essential respects. In the first place, I can now see that I mistook a crack in the specimen for *r–m*, this cross-vein being actually a little beyond the base of R_{4+5}. Secondly, there are faint but distinct traces of M_3 and of *m*. Thirdly, by a little chipping it was possible to clear the tip of the wing, and to see that the costa extends beyond R_{4+5}. The corrected figure given herewith shows these points. Except for R_{2+3} being a little farther from R_1, and the discal cell being a little shorter, the venation of *P. fittoni* proves to be identical with that of the still-living genus *Olbiogaster*. These differences are unimportant, and I think *P. fittoni* may be definitely referred to *Olbiogaster*.

Eothereva simplex, Cockerell.

This fossil fly has recently been described from Eocene deposits of Roan Mountain, Colorado, by Prof. T. D. A.

Cockerell (Proc. U.S. Nat. Mus. lvii. p. 251, 1920). It was referred by the author to the Therevidæ, but the photograph given aroused a strong suspicion that the insect was really an Anisopodid. In response to my request, Drs. J. M. Aldrich and Harrison G. Dyar have kindly re-examined the type and report as follows :—"We do not see any closed anal cell, or anything approaching it, and think the insect shows all the characters of the Rhyphidæ, antennæ and all. There are two little ridges in the stone crossing the specimen, which may possibly have been confused by Cockerell with veins." Dr. Dyar sent a sketch of the wing, which shows a venation closely similar to *Anisopus* and *Olbiogaster*, more especially to the latter of these genera; R_{2+3} is represented as further from R_1 than is the case in recent *Olbiogaster*, but only very slightly waved, not strongly so as in *Anisopus*, while *m–cu* is only slightly before the level of *r–m* (as in *Olbiogaster*), instead of much before it as in *Anisopus*. I do not see sufficient reason for maintaining the genus *Eothereva*, and would regard it as a synonym of *Olbiogaster*, though the antennæ appear to be shorter than in any recent species I have seen.

Mesochria scottiana, End.

This was described by Enderlein from the Seychelles Is. A female specimen of the same or a very closely allied species has been received from the Gold Coast from Drs. Ingram and Macfie. This was reared from a pupa found in decaying banana-fibre. The pupal skin was preserved and will be figured by Dr. Keilin. It resembles the pupæ of *Mycetobia* and *Anisopus*.

Ischnothrix ætherea, Bigot.

I mention this species here because it was stated by its describer to be related to *Trichocera* and to possess ocelli. I have examined the type, which is in good condition in the Paris Museum, and find that it has no ocelli and is evidently a Limnophiline form. It has all the characters of Alexander's genus *Orolimnophila*, the venation being identical with that of the recently described *O. eluta*, Edw., from New Zealand. Bigot's name must replace Alexander's for this genus, unless the still earlier *Lachnocera*, Philippi, be proved identical.

Paracladura, Brunetti.

This has been regarded by Alexander as synonymous with *Trichocera*, but it appears to me to be well distinguished, not only by the form of the discal cell and the nature of the medio-cubital connection, but also by the extreme shortness

of the first tarsal segment on all the legs, this segment being only about twice as long as broad, while the second segment is long. In addition to the two species described by Brunetti, I have examined most of the species of *Trichocera* recently described by Alexander from New Zealand. All these belong to *Paracladura*.

Trichocera antarctica, sp. n.

♀. Brownish; wings unmarked. Palpi rather long, the last segment slightly swollen towards the tip, and scarcely shorter than the preceding two together. First flagellar segment of the antennæ cylindrical, almost twice as long as the second; segments 2–4 subequal. Ovipositor short, strongly curved, pointed, chitinized. Wings with numerous but short macrotrichia on most of the veins; a patch of macrotrichia also in cell 2*nd* R_1, also a few more in cell Sc_1 above these. Sc_2 before the middle of *Rs*. R_{2+3} extremely short, not more than one-eighth as long as the first section of R_2. Cell R_2 rather conspicuously narrowed at the tip. Cross-vein *r–m* rather longer than the basal section of R_{4+5}. Cell M_1 about as long as the stem.

Length of body 8 mm.; wing 8 mm.

Campbell Island: 17. vii. 1903 (*L. Cockayne*).

Type ♀ in the British Museum.

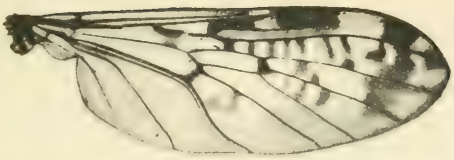
Although the specimen is immature and damaged, I have described it because it shows some very distinctive characters, and is, moreover, the first true *Trichocera* to be recorded from the Southern Hemisphere. As mentioned above, all the six species described from New Zealand as *Trichocera* belong to *Paracladura*.

Trichocera bimacula, Walk.

It has been suggested that this is the same as the European *T. maculipennis*, Mg., but I believe it is a distinct species. Walker's type male is in good condition and differs from *T. maculipennis* in having the abdomen conspicuously banded, the basal halves of the segments being ochreous, the apical halves black; also it lacks the basal tubercle of the male claspers which is present in *T. maculipennis*. Specimens of *T. maculipennis* from Italy, Scotland, and Iceland agree in structure.

Trichocera gracilis, Walk.

Since the type is a female, it cannot be definitely identified, but shows little difference from *T. fuscata*, Mg, except that the cell M_1 is a little shorter than its stem.



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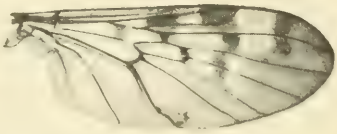

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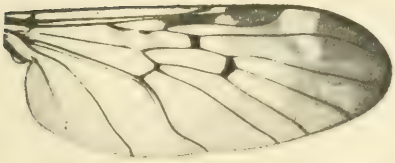

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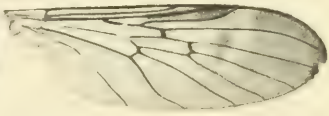

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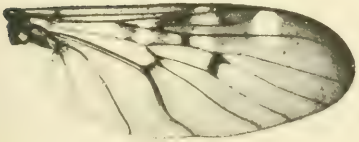

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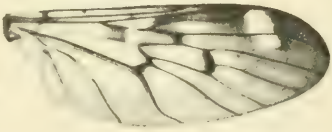

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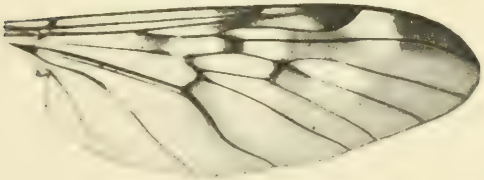

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9

WINGS OF ANISOPUS.

Trichocera annulata, Mg.

This species is represented in the British Museum from Algiers (*Miss G. Ricardo*) and Jerusalem (*Dr. P. A. Buxton*). These appear to be the most southerly records of any European species.

EXPLANATION OF PLATE XVI.

Wings of species of *Anisopus*, all × 9.

Fig. 1. *A. ornatus*, sp. n.
Fig. 2. *A. marmoratus*, sp. n.
Fig. 3. *A. annuliferus*, sp. n.
Fig 4. *A. tibialis*, sp. n.
Fig. 5. *A. pauperatus*, sp. n.
Fig. 6. *A. albicornis*, sp. n.
Fig. 7. *A. malayensis*, sp. n.
Fig. 8. *A. undulatus* (Lamb).
Fig. 9. *A. notatus* (Hutton).

XLVIII.—*Mating-habits of* Lycosidæ.

By G. H. Locket.

Courtship among spiders is, as far as we know, confined to the families Attidæ and Lycosidæ. It consists of a series of rhythmical motions of the front legs (and sometimes of the palps) performed by the male before copulation, and it is accompanied by power of vision in the spider. Courtship among the Attidæ (where it is most marked) and its connection with sexual selection has been dealt with in some detail by Prof. and Mrs. Peckham, of Wisconsin (Proc. Nat. Hist. Soc. of Wisconsin, 1889), but the Lycosidæ have been little studied in this respect.

My attention was first drawn to this subject by an observation I made in 1919 on some specimens of *Lycosa amentata* (= *L. saccata* (Blackwall), 'Nature,' Nov. 11th, 1920). I saw that the male spread out his palps sideways (one being extended downwards at about 45°, the other upwards at a similar angle), and that after withdrawing them he repeated the movement whenever he confronted the female. I was not aware at the time that any other work had been done on these movements of males in the Lycosidæ.

T. H. Montgomery (Proc. Acad. Philadelphia, Pa., Jan. 1903), however, has watched the courtship, mating, and "sperm-introduction" of the species *Pardosa nigropalpis*

Emerton), *Lycosa stonei*, *L. lepida*, *L. scutulata* (Henz.), *L. ochreata pulchra* (Montg.).

He concludes that the straightening out before him by the male of the first pair of legs and their subsequent withdrawal is but an exaggerated performance of motions that he exhibits in other mental states (*cf.* elevation of the front legs when attacked). He also maintains that the presence of black hairs on the front legs of the male does *not* determine his movements as one might suppose—that is, he does not necessarily seek to display these to the best advantage of the female. The only species he quotes as using the palps in these movements is *Pardosa nigropalpis*. I should doubt whether the number of the species observed by Montgomery is large enough to permit of a generalisation such as he has made. The following observations, although fragmentary and far less complete than those of Montgomery, are, none the less, fairly representative of the family, and show that courtship of a very definite kind is general, and that, though movements of the *legs* might be described as "exaggerations" of normal movements (it is difficult so to describe those of *Tarentula barbipes*, v. below), those of the palps in *Lycosa amentata* and *L. nigriceps* cannot by any means be accounted for in this way.

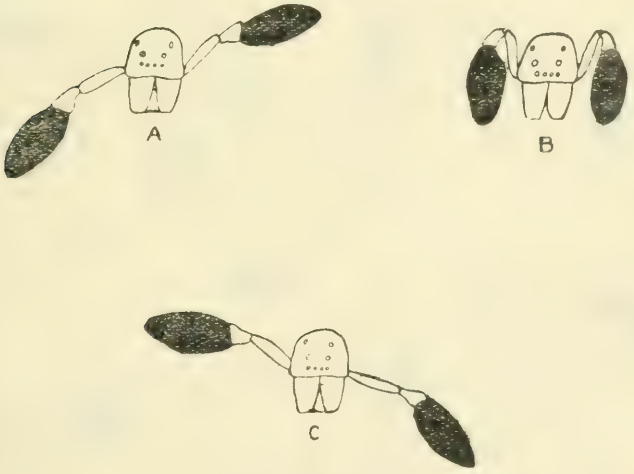
The observations made so far are only of a preliminary nature. I have not had time as yet for the long periods of watching required to see the whole process of courtship, mating, and "sperm-induction" (or the re-charging of the palpal organ by the male). But they are sufficient to establish (with Montgomery's results) the existence of a definite courtship among different genera of Lycosidæ quite analogous to, but less complicated than, that found among the Attidæ.

My observations were as follows :—

In April 1922 I set about to confirm my original observations on *Lycosa amentata*. I placed a male and female in a large glass case, where they could be watched from any angle. The male on sighting the female started his usual antics. He raised himself as high as possible on his legs, extended his palpi as indicated above, withdrew them, and extended them again, their positions reversed (fig. 1). Each time he did this he (usually) took a pace towards the female, and his abdomen quivered now and then. He would often work his way round the female, leaning over in the direction he was going (the movement reminded one of Peckham's figures of *Saitis pulex*).

Later, after feeding both spiders, I placed them in a glass-topped box, in which there was no cover under which they could hide, and continued to watch them. The female was very excited at times, the abdomen pulsated and the front legs quivered. As the male approached she would extend a leg towards him. Occasionally she approached him, obviously excited, her abdomen quivering. The male, however, always retreated before her, continuing his movements. The same movements were observed with another female. After leaving them in the dark for a time I found them separated and apparently taking no notice of each other, but the male at once started his antics again

Fig. 1.



Lycosa amentata. Movements of ♂ palpi.

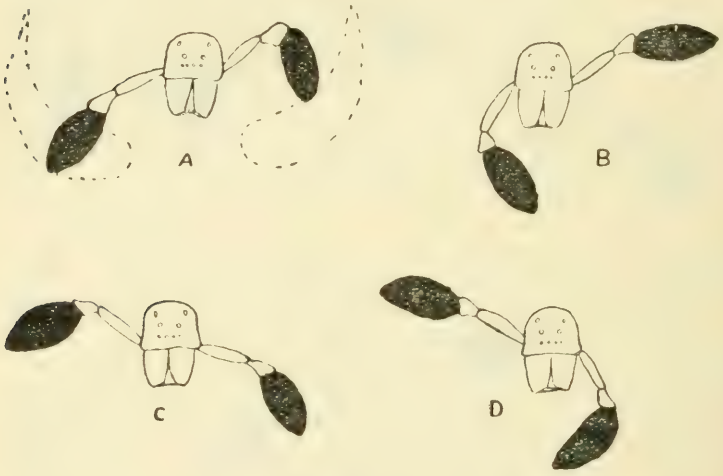
when put in the light. Another female was tried, but she always chased the male away. I never saw the mating accomplished with this species. On examination I found that two of the females were immature. That the male should perform before immature females seems very surprising, but Montgomery has observed this in *Lycosa scutulata* and even the act of copulation in *L. ochreata pulchra* before the female's last moult.

On one occasion the male could not possibly have seen the female during part of his performance—this will be referred to again later.

Lycosa nigriceps. (April 17th, 1923.)

Specimens were found on a heath. The male started to make movements before the female in an adjacent glass tube; they were therefore placed together in a glass-topped box. The movements of the male's palps (which have dense black conspicuous digital joints) were as shown in the diagram (fig. 2). They had a rotatory motion (not synchronised) which consisted of a series of jerks so quick in succession that the movement seemed continuous. Normally both palps would be in motion together, but on some occasions they were moved singly. The whole body—abdomen and legs—quivered as the male advanced. On two occasions he was

Fig. 2.



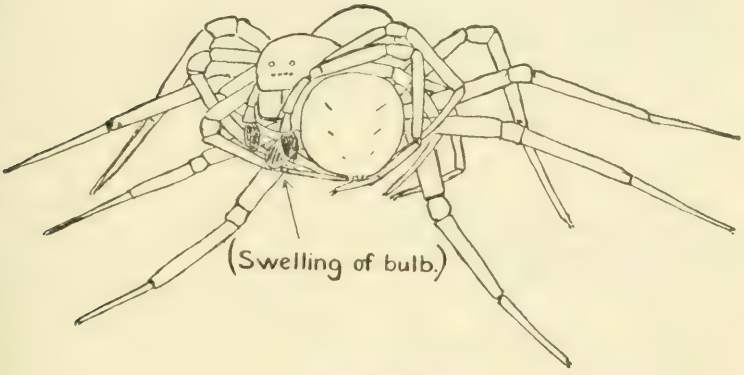
Lycosa nigriceps, ♂.

seen to perform his antics while walking *away* from the female, who on this occasion did not respond appreciably.

The next day I again put them together and watched them for some hours. The male's movements were the same, and he often brought the palps into a position underneath the chelicerae after a "revolution." He did not by any means always face the female, and often continued his "dancing" with her right behind him. Both would often sit for a long time without moving, but as soon as the female moved the male would start again and follow her about the case (he could obviously see her distinctly and would turn his head to face her). On one occasion the male ran about with a violent trembling of the front legs and palps.

The female seemed little affected by his advances, and whenever she encountered the male would either run away or push right over him. At last, as they encountered, the male came up to the female and caressed her front leg with his (which were trembling). She ran off, but he followed her all over the case; they encountered each other again and the female ran away, but turned round at a distance of 3–4 ins. and came back. The male caressed her front legs as before, and crawled on to her back. Their relative positions during copulation and the swelling of the digital joint were exactly the same as with *Lycosa pullata* (fig. 3), which will be described presently.

Fig. 3.



Lycosa pullata.

In the following each stroke represents the application of the palp:—

Left (of ♀).	*Right* (of ♀).
	1
1 (was interrupted)	1 (12 seconds)
1	1 „ „
1	1 (two swellings)
1	1
1 (23 seconds—two swellings)	1
1	1
1 (14 seconds—one swelling)	1

(At this point the female moved about and the male stopped his applications and hung on, one palp at each side—he resumed as soon as she stopped.)

1 (27 seconds—two swellings)	1 (two swellings)
1	1
Total 9	Total 10

Finally, the female moved about and they separated. The male rubbed his palps against each other and started his antics again.

Lycosa pullata. (April 17th, 1923.)

I caught a pair of this species in the act of copulating, and continued to watch them in a tube. The palps of the male were applied as in the diagram (i. e., *left* palp on *left* side of female) (fig. 3).

I saw five applications of the palp on each side, and the male then turned so that they were head to head, but he reverted to the previous position and continued as before. Very often after an application he would rub the palps together between the chelicerae.

The strokes represent (as before) the applications of the palps :—

Left (of ♀).	*Right* (of ♀).
1	1
1	1
1	1
1	1
1 (palps rubbed between the chelicerae and applied again)	1
1	1 (lasted 3 minutes 50 seconds)
1	1
1	1
1	1
1	1
1 (palps rubbed between the chelicerae and applied again)	1
1	1
1	1 (very short, only a few seconds)

One application was timed as taking 3 minutes 50 seconds —this was unusually long, 5–10 seconds (and upwards) was about the average.

When the palp was applied there was immediately a large swelling of the "bulb," which reached about four times the size of the digital joint. This swelling gradually subsided and the bulb was either re-inflated or the palp withdrawn.

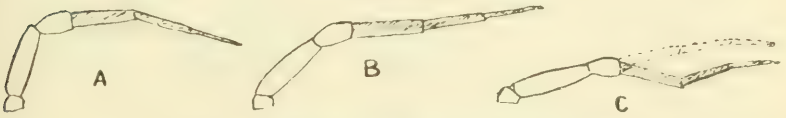
The total number of applications *observed* (there must have been more before the specimens were captured) was 36 (18 each side.) This took roughly $1\frac{1}{2}$ hours.

The female did not seem to be particularly affected by the action, and continued to make efforts to get out of the tube.

I had observed the mating of *Trochosa ruricoli* some time previous to this (March 21st, 1921). (This species presents the difficulty that it is nocturnal in its habits and has to be watched by a very subdued light.)

Two females had been kept for three months in captivity, and were well-fed. A male was introduced into the case (it was the large glass one mentioned above), and after walking round for about five minutes confronted a female at a distance of about one inch. He immediately caused his front legs to quiver, the female proved hostile, so he backed away. He continued movements with his legs, however, and moved his palps up and down. (The successive positions assumed by the front leg are shown in fig. 4.) He continually rubbed the palps against one another, against the chelicerae, and whenever he encountered any objects (pieces of moss etc.) he felt them all over with his palps. Eventually, after these movements had been going on for some time, I placed the pair in a smaller glass-topped box. The

Fig. 4.



Trochosa ruricola, ♂. Movements of front leg.

male walked about the box slowly, going through the same motions with the front legs, *i.e.*, drawing them up and gradually extending them (singly); as they became fully extended they trembled violently (especially the tibiæ and tarsi). At last he approached the female and extended his front legs towards her; she backed, but reciprocated his movements with her front legs. He then proceeded to touch her all over with his front legs and she raised her abdomen. The male then crept into the usual position on her back, the pair gave two spasmodic jerks and then remained still (the male's abdomen pulsated from time to time). This jerking took place whenever the male applied the other palp. There were six applications—they lasted for periods of 1–9 minutes. Total time taken was 36 minutes. Their relative positions during copulations were similar to those observed in *Lycosa nigriceps* and *L. pullata*.

On April 10th, 1922, I observed a male approach a cocoon in which was a female, with the same movements, and he entered the cocoon in order to mate. It is probable

that this is what usually happens, since at this time of year the females are usually found in cocoons under stones etc., in which they have spent the winter.

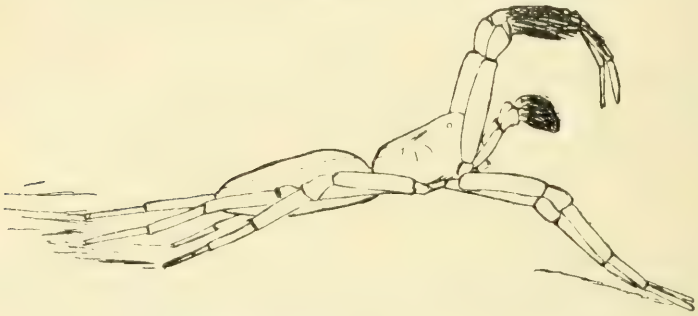
Tarentula barbipes. (April 20th, 1923.)

I did not observe the actual mating in this case, but the movements of the male in front of the female were interesting.

In this species the tibiæ of the front pair of legs of the male are clothed thickly with dense black hairs.

The motions were as follows:—Starting with the front legs stretched out (where they often vibrated), they were drawn up, and the palps with them, and then let down to the ground suddenly (fig. 5). The legs were moved together (synchronised), and the spider took a step forward each time that the motion was made. On one or two occasions

Fig. 5.



Tarentula barbipes, ♂. Courting attitude.

the front legs were seen to tremble violently for a second or so, sometimes also the other legs.

The male would approach the female (often in semi-circular motions), he would often walk right away again and sometimes come right up to her and caress her with his front legs, when very often she would answer with *violent* motions of the front legs, but I never saw the mating completed on this occasion.

On another occasion I removed the female while the male was performing his antics, and he continued for a little after she was gone. Montgomery records a similar fact with regard to *Lycosa scutulata*, but in this case the male *started* his motions when out of sight of any female and continued them for some hours.

Tarentula cursor (Hahn).

(This is not an English species, but is widely distributed on the continent and resembles our common tarantulas closely.)

There were no very conspicuous movements on the part of the male, no dark hairs on the legs, and no display was made with these. The palps were moved up and down alternately and very rapidly, and this constituted the courtship. He walked about with jerky movements and tried to get either in front or behind the female. She was seen to be excited from the fact that her front legs trembled and were moved up and down from time to time when the male was near. He tended to move from side to side while approaching her, moving his palps up and down and rubbing them against each other and against the cheliceræ (on one occasion he walked in the opposite direction after encountering the female). After encountering each other twice and separating, the third time the female was seen to be excited, the male approached and got into the usual position. The movements were very similar to those of *Trochosa ruricola*, except that they were very fast as compared with the rather slow movements of the latter. The positions were the same.

Left (of ♀).	*Right* (of ♀).
1	1 (first)
1 (17 seconds and separated after violent struggles by the ♀)	1 (fairly violent struggles by the ♀)

Total time 1½ minutes.

This may not have been the complete process, since the female struggled so hard and was kept down by sheer force by the male (his legs are particularly suitable for this). (He had mated for an even shorter time before with another female.)

General Considerations.

In the first place, it is evident that the male spider has to *see* the female before he is stimulated to start the movements described. I have never seen a male perform *before* he has seen a female (v., however, the case of *Lycosa scutulata* observed by Montgomery).

That these motions, and not merely the final contact of the front legs, influence the female is apparent from her obvious signs of excitement (such as trembling of the legs) which she shows from time to time. In the case of the *Tarentula cursor* the female did not appear to be influenced at all, but suddenly

seemed to be ready for the male after he had been present for some time. In some cases (e. g., *Lycosa nigriceps* and *L. pullata*) the female seems to be little affected by the process of copulation and attempts to continue her ordinary life. With *Tarentula cursor* she struggles violently and has to be held down forcibly by the male.

The male, on the other hand, shows very evident signs of excitement during the actual mating-process (for instance, pulsating of the abdomen and convulsive movements).

In all the species in which we find courting movements, the males possess secondary sexual characters, such as black hairs on the legs, or black digital joints of the palpi (even *Tarentula cursor*, where courtship consists merely in an up and down movement of the palpi, has the digital joints of these darkened). The converse of this is *not* apparently true—namely, that secondary sexual differences are always associated with courtship by the male. We can, however, say this much for certain—that in all the species studied that appendage, which possesses special characters, such as dark hairs, is always intimately connected with the movements before the female. In *Lycosa nigriceps* and *L. pullata* it is the palpus. In *Tarentula barbipes* it is the tibiæ of the front legs. In *Trochosa ruricola* the tibiæ, metatarsi, and tarsi are darkened, and it is this part of the leg which shows the greatest amount of movement. I cannot with this small amount of evidence say whether or no Montgomery is right in concluding that the male does *not* seek to display his dark hairs to the female, I can only say that in the species observed his movements before her invariably involve these special characters.

In conclusion, I should like to express my thanks to Dr. A. M. Jackson, of Chester, for very kindly classifying my specimens.

XLIX. — *Notes on Australasian* Rhyphidæ.

By A. L. Tonnoir, Research Student in Diptera at the Cawthron Institute, Nelson, N.Z.

In the course of two years' collecting and study of Diptera in Australia and New Zealand I came across five representatives of this family, one of which, belonging to the genus *Olbiogaster*, was not previously known.

The four other species belong to the world-wide genus

Rhyphus, and one of them is common to New Zealand and Australia.

Rhyphus neozelandicus, Schin.

This species is common to Australia and New Zealand. I know it from :—

Victoria : Sassafras.

Tasmania : Burnie, Cradle Valley, Lake Margaret, all those localities being in the N., N.W., and W. of the island.

New Zealand : Schiner records this species from Auckland. I found it all over the South Island ; it seems to be the most common species in the south.

Rhyphus dubius, Macq. = *R. brevis*, Walk.

Besides the localities given by G. H. Hardy in Proc. Roy. Soc. Tasm. 1919, p. 119, I can mention :—

Tasmania : National Park, Eagle-Hawk Neck, Adventure Bay, Harz Mts., Burnie, Cradle Valley, and Strahan, which shows that this species is spread all over the Island.

Victoria : Sassafras and Fern Tree.

South Australia : Adelaide.

New South Wales : Killara and Wentworth Falls in the Blue Mountains.

Rhyphus notatus, Hutton.

Besides the localities given by Hutton—Auckland, Wellington, and Christchurch—I know it from the west coast of the South Island and the Southern Alps. It is the most common species around Nelson. Its size is rather variable, the wing's length ranging from 5 to 8 mm.

Rhyphus undulatus, Lamb.

This species is very similar to the preceding one, with which it is found ; it differs by the scape of the antennæ, which is dark above and only dull orange below ; the wing-markings are not so dark, and the two hyaline spots which come before the apical dark fascia on the anterior part of the wing are more or less confluent. The ♂ hypopygium is quite distinct, the claspers being more or less in shape of an axe, and not hook-shaped.

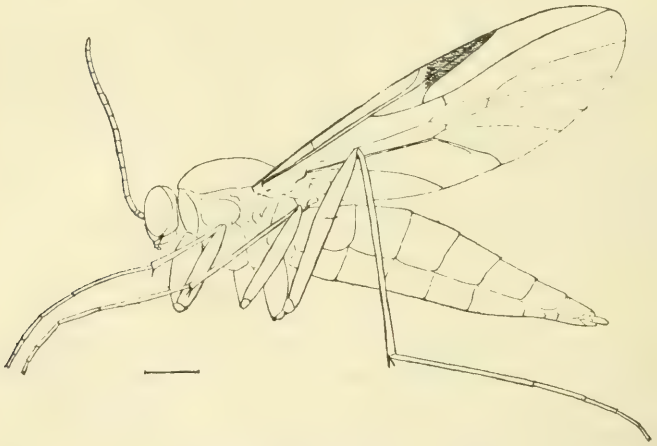
Described from Auckland Island, it is widely distributed in New Zealand :—Nelson, Tarawera, Tiritea, Mt. Arthur, and Waiho, from September to January.

Olbiogaster insularis, sp. n.

♀. *Size.*—Length 9 mm.; wing 8; antennæ 4.

Face brown-black, shining, the portion just below the antennæ mat-yellow; frons brown, covered with a yellowish pruinosity, vertex black; the pubescence of head yellowish brown, lighter on the lower part of the occiput; palpi and labellum testaceous. Antennæ dull black, the scape orange, with dark markings in front.

Pronotum swollen and bright orange; mesonotum blackish brown, brightly shining, with two ill-delimited rufous bands on the disc; scutellum orange; metanotum brown; side of the thorax orange and blackish brown; the anepisternum,



Olbiogaster insularis, sp. n., ♀.

metasternum, and hypopleura being dark, the rest orange. The metasternum has a slight cinereous reflection.

Anterior coxæ orange, with the anterior basal part brown, the two posterior pairs brown. Anterior femora orange except at the base, tibiæ completely light as well as the basal part of the metatarsi, the tarsi gradually darker towards the end; middle legs with the femora nearly all dark except at the end, tibiæ and tarsi as in front legs; hind legs completely dark. The anterior tibiæ with one apical spur, the others with two, all these spurs orange.

Wings bare, strongly iridescent, with a very slight brownish suffusion and a blackish-brown stigma which fills all the

space between R_1 and R_{2+3}, but not completely the one between R_1 and *Sc.* Venation as shown in the figure; in the figure of the complete insect, the wing being somewhat obliquely placed is not represented in its true width, which is, however, but little greater.

Halteres with orange stem and brown knob.

Abdomen conical, base of the four first visible tergites narrowly orange, the rest shining black; first abdominal sternite orange, the others gradually darker; the subgenital plate and lamellæ orange, the first is bilobed. All the pubescence of the body is short and yellow; there are no macrotrichiæ.

Only one specimen (the type), in the collection of the Australian Museum, Sydney, from Mt. Gower, Lord Howe Island, collected by Mr. A. R. McCulloch, 19th January, 1922.

L.—*Exotic* Muscaridæ (*Diptera*).—XI.* By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

Genus Orthellia, R. D. (Cryptolucilia, B. & B.).

Judging from the fact that most of the recent writers on this family have made unsatisfactory attempts to place the species of this genus and those of *Pyrellia*, R. D., I consider it advisable to record some data upon the genus. Ordinarily in the case of Palæarctic and North American forms the characters used in Williston's 'Manual of North American Diptera' may be depended upon to separate the genera, but many of the exotic members of *Orthellia* have been placed in *Pyrellia*, a fact which leads one to conclude that there may be some variation in the bend of the fourth vein and the number of posterior sterno-pleural bristles, the two characters used for the separation of the genera. This is in fact the case, so that some other means require to be adopted for the recognition of these segregates.

I have, I believe, struck upon a character which may be used sucessfully, namely, the presence of setulose hairs on a narrow strip of chitin on the lower margin of the declivous portion of the mesonotum immediately in front of the base

* For Part X., see Ann. & Mag. Nat. Hist. (9) xii., August 1923, pp. 177–194.

of the scutellum. These hairs are present in *Orthellia* and absent in *Pyrellia*.

It appears to be worth while to point out that these hairs are present also in the genus *Lucilla*, R. D., which is relegated through the presence of hypopleural bristles to the family Calliphoridæ. That this series of bristles may almost invariably be depended upon to separate the families of higher Muscoidea is well known, and in fact they constitute the principal character for the differentiation of Tachinidæ and some other families as at present accepted from the Muscidæ, Anthomyiidæ, and Scatophagidæ of authors. The study of many exotic forms has, however, convinced me that there are some forms which have these bristles very weak or almost absent, and that there are some others which have hairs of varying degrees of development that may be considered as at least representing the bristles if not equivalent to them. So that there is not the abrupt break in the series which is suggested by existing literature upon this phase of the study of these flies.

The occurrence of the setulose hairs above referred to in two genera which are referable to different families, and which have identical larval habits, would appear to indicate that the importance of the hypopleural bristles as a character for the classification of these insects has been over stressed. It may yet be necessary to review our system and align the so-called families of higher Muscaridæ under one family name and consider them all as subfamilies, the more so when we consider the very different comparative values of these families and those in the Nematocera and Brachycera.

Of the species which have been erroneously assigned to *Pyrellia* and which really belong to *Orthellia*, I have seen the following.

Orthellia nudissima, Loew.

This species is readily distinguished from its allies by the very conspicuously punctate dorsum of thorax and abdomen, but it is difficult to decide, with the material on hand, if the species is variable to an unparalleled extent, or whether there are several closely-related species possessing similar characters.

Villeneuve described *aurantiaca* and *limbata* as varieties of *nudissima*. Both have the costal margin of the wing black, but *aurantiaca* has the abdomen testaceous, while *limbata* has it blue as in the typical *nudissima*. Stein later described *bimaculata* as a distinct species, but it may only be a variety of *nudissima*, as I believe is also a specimen from

Embu, B.E.A., now before me. This specimen has the antennæ and palpi orange, face and apex of fourth visible tergite red, and the costa of wings black in subcostal and marginal cells except at base of latter. In the last character it agrees with *bimaculata*, as which I have identified it tentatively. Only a very careful survey of the different forms on the ground will eventually decide the specific relationships.

Orthellia inflata, Townsend.

This species was made the genotype of Townsend's genus *Pseudogymnosoma*, but I can see no valid reason why it should be removed from *Orthellia*.

Like *nudissima* it has the dorsum of the abdomen and thorax, and especially the scutellum, with dense minute piliferous punctures. The abdomen in the male is more globose in the two species than in any of their allies, and has no strong bristles. The only distinctions between the two are to be found as stated in the key, and at one time I considered it possible that they were only forms of one species. However, in the meantime, I allow them to remain as distinct. The anterior sterno-pleural bristle is absent in all the specimens of *inflata* which have hyaline wings, but in one which has the costa with a black border which is interrupted at middle this bristle is as in typical *nudissima*, present but weak and small. The legs are very slender in both forms, and the femoral bristles are weak, though there are two or three very short and rather stout spines on the ventral surface of mid-femora. The bend of fourth vein is rounded.

Length 7–8 mm.

Originally described from Benguella. I have before me one male from N.W. Rhodesia, Kasempo District, 1. ix. 1907, on fæces (*A. Y. Massey*).

Orthellia rhingiæformis, Villeneuve.

This remarkable species with its peculiar shaped head, which is drawn out at the vibrissal angle as in the Syrphid genus *Rhingia*, has characters which agree in general with the type of *Orthellia*.

The thorax has usually 2 + 3 dorso-central bristles, but the one in front of and the one behind suture are very short and weak in the males. The palpi in both sexes are very long, extending to apex of vibrissal angle, slightly dilated apically, and have a few sparse long hairs along their entire length.

Localities. Kabete, B.E.A.; Kilolo River, north of Mt. Kenia; top of the Aberdares; Ruwenzori, 10,000 feet.

Orthellia albigena, Stein.

Originally described as a *Pyrellia*, but afterwards removed to *Cryptolucilia* by its describer. I have seen this species also from Natal and Angola.

There are five pairs of dorso-centrals (2+3) in this species, and the orbits in both sexes lack the strong forwardly-directed bristle that occurs in some allied species. The halteres are yellow. (Durban Museum.)

Orthellia nigrohalterata, Stein.

Also described as a *Pyrellia*, but not removed from this genus in Stein's catalogue of the species of the Anthomyiidæ of the world as was the last species.

This species has two presutural dorso-centrals and three postsutural, but of the latter only the one immediately in front of the scutellum is well developed, and the other two, which are rather close to it, are very small, the anterior one especially so. As the specific name indicates, the halteres are black.

Seen only from Natal. (Durban Museum.)

Specimens of the foregoing three species will be sent to the British Museum.

Orthellia latifrons, sp. n.

Female.—Very similar to the last species. Differs in having the frons much wider, its greatest width being about twice the length of third antennal segment, whereas in *nigrohalterata* it is about 1·5; the face is densely white tomentose, and the frons is slightly whitish pruinescent and opaque, except on the upper two-thirds of each orbit, where the colour is metallic blue-green, but not conspicuously glossy; in *nigrohalterata* the face is more silvery, the frontal stripe is blackish, and the orbits have a larger proportion of their length shining, the upper half blue-black, the lower black; the antennæ are slightly rufous at apex of second and base of third segments, and not black. Both species have an extra bristle on each side of the prescutellar acrostichal pair and mesad of the dorso-centrals, that are not present in the other species known to me; the two presutural pairs of dorso-centrals are stronger in this species than in the last. The blackish base of wings which characterises *nigrohalterata*

is almost absent in the present species, and the calyptræ are paler. The only specimen has three or four long bristles on the basal half of the postero-ventral surface of the hind femur, while in the specimens of the last species which are before me there is but one such bristle near middle on that surface. The wings in *nigrohalterata* are almost uniformly covered with the usual microscopic hairs, while in the new species these hairs are confined to the apices of the cells along the hind margin of the wing and to a small area in apex of the discal cell.

Length 8 mm.

Type, Malvern, Natal, 16. v. (*C. N. Barker*). (Durban Museum.)

Orthellia siamensis, sp. n.

Female.—Head black, cheeks and upper orbits with a violet-blue sheen, the latter largely whitish pruinescent as in *latifrons*; face and parafacials white pruinescent; antennæ and palpi fuscous brown. Thorax deep violet-blue, without white pruinescence. Abdomen unicolorous metallic blue. Legs black. Wings hyaline, very little darker at bases. Calyptræ brown, except at connecting angle. Knobs of halteres black-brown.

Structurally similar to *latifrons*, but the frons is barely one-third of the head-width. As in that species, there are three posterior sterno-pleural bristles instead of two as in *nigrohalterata*. The hind legs are armed as in *latifrons*, even to the hairs on the upper hind margins of the coxæ, which are absent in *nigrohalterata*.

Length 8 mm.

Type, Nah Khum, N.E. Siam (*J. F. Godfrey*).

It is possible but not probable that this is a variety of *latifrons*.

Pyrellia albocuprea, Villeneuve.

I have seen six specimens I identify as this species from the top of the Aberdares, 9500 feet, and one from the north of Mt. Kenia.

The species agrees with *cadaverina*, L., in lacking the setulose hairs on the lower margin of the declivous part of thorax in front of the base of scutellum, but has the thorax with three white-pruinescent vittæ in front, and the eyes hairy. The brassy tinge of the thorax and abdomen is very conspicuous. Villeneuve mentions the presence of two pre-sutural acrostichals, but I assume that this is a slip for two

"prescutellar" acrostichals. Provided his statement is correct, my identification is erroneous, but the specimens agree so well with his description that I believe they belong here.

Orthellia cyanea, Fabricius.

The vibrissal angle in this species is very noticeably produced, but not so elongate as in *rhingiæformis*. It differs from that species in having the thorax with but two pairs of dorso-centrals, postsutural, the eyes more strikingly hairy, and in being dark blue in colour.

Localities. Estcourt and Willow Grange, Natal, and west of Mt. Kenia, B.E.A.

Orthellia aureopyga, sp. n.

Male and *Female*.—Very similar to *spinthera*, Bigot (det. Bezzi). The colour of the head is black, with upper frontal orbits and part of the cheeks violet-blue. Thorax metallic blue or blue-green (male); fourth visible tergite bright brassy or golden, more purplish in male, sharply contrasting with the other tergites. Wings clear. Calyptræ white. Halteres yellow.

Eyes bare, in male separated by about width of third antennal segment, the orbits fine-haired; in female the frons is about one-fourth of the head-width at vertex, slightly widened anteriorly, and wider than in *spinthera*, and, as in that species, there is a strong forwardly-directed bristle above middle of each orbit. Thorax with 2+4 dorso-centrals, the anterior two pairs behind suture short, rarely with three pairs behind suture. Abdomen normal, no strong median bristles on fourth visible tergite. Mid-tibia normal, hind femur with one postero-ventral median bristle and four or five on apical half of antero-ventral surface. Wings normal.

Length 7 mm.

Type, male, allotype, and one paratype, south-east edge of Kenia Forest, B.E.A., 5000–6000 feet, 7. ii. 1911 (*T. J. Anderson*).

Orthellia marginipennis, Stein.

A specimen which I take to be this species has the costa narrowly deep black from base to apex of wing, the thorax with a white-pruinescent spot in middle of front margin, and two pairs of weak presutural and two or three pairs of prescutellar dorso-centrals. The upper frontal orbits are described as glossy black by Stein, but in this specimen they

are metallic blue. It may be that I am wrong in identifying this as *marginipennis*, but only an examination of Stein's type will disclose if this is so.

Locality. Kawanda, Uganda, 12. viii. 1921 (*H. Hargreaves*).

Orthellia rubrifacies, sp. n.

Female.—Occiput blue-black; frons, face, antennæ, and anterior half of cheeks orange-red; upper half of frontal orbits slightly purplish; antennæ orange-red; arista black at extreme base; palpi black. Thorax metallic blackish green or blue, with a coppery or violaceous tinge, the white-pruinescent anterior spot is usually divided in middle. Abdomen coloured as thorax, but more pronouncedly violaceous, especially at apex. Legs black, femora slightly violaceous. Wings clear, some small fuscous spots in basal cells and a faint one at humeral vein. Calyptræ black, the connecting angle yellowish white. Halteres pale yellow.

Eyes bare or almost so: frons nearly one-third of the head-width, each orbit about as wide as interfrontalia, fine-haired, without strong forwardly-directed median bristle; cheek higher than width of parafacial, vibrissal angle slightly produced. Dorsum of thorax with rather long erect black hairs, and no well-defined dorso-centrals except two pairs in front of scutellum, neither the prescutellar acrostichals nor the third postalar distinct, posterior intra-alar fine; sterno-pleurals 1 : 1 or 1 : 2. Abdomen without strong bristles. Fore and mid tibiæ normal; postero-ventral bristles on mid-femur very fine, inconspicuous; hind femur with a sparse series of fine bristles on antero-ventral surface and a few on basal half of postero-ventral; hind tibia with four or five fine bristles on antero-ventral surface, no other bristles evident. Venation normal.

Length 8–10 mm.

Type and four paratypes, south-east edge of Kenia Forest, 5000–6000 feet, 7. ii. 1911; one paratype, 5 to 7 miles into Kenia Forest, near Luchi River, 9–10. ii. 1911 (*T. J. Anderson*).

Orthellia dubia, sp. n.

Female.—Upper orbits violet-blue, anterior margins and parafacials silvery-white pruinescent; cheeks purplish; antennæ and palpi black. Thorax metallic blue, with a violet tinge, no white pruinescence present on dorsum. Abdomen uniform metallic blue-green. Legs black, femora slightly purplish. Wings clear. Calyptræ pure white. Knobs of halteres fuscous.

Eyes bare; frons nearly one-third of the head-width, orbits as in *splendida*, each narrower than interfrontalia. Thorax with but two pairs of prescutellar dorso-centrals, the prescutellar acrostichals, third postalar, and one intra-alar distinct; sterno-pleurals 1 : 2. Fourth abdominal tergite without a median series of bristles. Fore and mid legs normal; hind femur with one outstanding median postero-ventral bristle, and a series on antero-ventral surface which become stronger on apical half; hind tibia with one postero-dorsal, one antero-dorsal, and one or two antero-ventral bristles, all very short. Wing-venation normal.

Male.—Metallic blue, the apical half of abdomen greenish blue, contrasting sharply with the purplish colour of the basal half. Femora purplish.

Eyes with the facets on upper half very much enlarged, the line of demarcation between them and the lower facets sharply drawn. Anterior dorso-central in front of scutellum very short and indistinct. Bristles of antero-ventral and basal half of postero-ventral surfaces of hind femur not strong, those on hind tibia very short.

Length 7 mm.

Type and two defective paratypes, Laibons, Lumbwa District, B.E.A. (*C. M. Dobbs*); allotype, male, Blantyre, Nyasaland, v. 1910 (*J. E. S. Old*).

Though there are several described African species which appear to belong to this genus which I have failed to identify, I consider it advisable to describe this one, as it does not agree with any description available to me.

Orthellia abnormis, sp. n.

Female.—Brilliant metallic blue, with a violaceous tinge on dorsum of thorax, the abdomen more greenish. Frons black, anterior margins of orbits whitish, violet-blue above; parafacial silvery white. Thorax and abdomen without any pruinescence. Legs black. Wings clear, veins fuscous. Calyptræ white. Knobs of halteres yellow.

Eyes nude; each orbit with at least one forwardly-directed bristle on upper half; parafacial linear; vibrissal angle slightly produced. Thorax with one pair of strong presutural dorso-central bristles and four pairs of postsuturals, the anterior two pairs very short; sterno-pleurals 1 : 3. Fourth tergite with a median transverse series of strong bristles. Hind femur with a few fine bristles on basal half of postero-ventral surface and a complete series on antero-ventral; hind tibia with the calcar rather long, one antero-dorsal and

one antero-ventral bristle. Bend of fourth vein rounded microscopic hairs on wings evenly distributed.

Male.—Frons about twice as wide as third antennal segment; each orbit with a series of rather strong setulæ and no forwardly-directed bristle; lower calyptra and the wing darker than in female.

Length 6–7 mm.

Type, female, Durban, Natal, 33. vii. 1919 (*A. L. Bevis*). (Durban Museum.)

The male may possibly belong to a distinct species, but it is from the same locality as the type and agrees so closely with it that I have linked them together pending the acquisition of more material. The same differences exist in *nigriceps*, Macquart.

Orthellia splendida, Adams.

Dr. Villeneuve redescribed this species as *Pyrellia ditissima* in 1916, but pointed out in his paper that he had seen the type of *splendida* and that his species was a synonym.

I have before me a male from Benguella, Angola, and, from its close resemblance to *lauta*, Wiedemann, suspect that it is this species which has been recorded as the latter from Africa. Stein places *bœriana*, Bigot, as a synonym of *lauta*, but it may be that it is the same as *splendida*, in which case it will replace the latter, which will fall as a synonym.

This and the next species have the facets of the upper half of eyes in the males very much enlarged as compared with those of typical forms, but I can see no good reason why Townsend's genus *Pseudorthellia* should be retained for this segregate.

Orthellia lauta, Wiedemann.

This name should be applied to the Australian species which is listed as *proerna*, Walker, *viridiceps*, Macquart, and possibly also *viridifrons*, Macquart.

The blackish marks on the dorsum of the abdomen are, so far as I know, not found in any other species referable to this genus. These marks are mentioned by Wiedemann, and appear to put the identity of the species beyond question.

Originally described from Java. I have seen it from Australia.

Orthellia spinthera, Bigot.

I have seen a female of this species named by Prof. Bezzi. In general it agrees with the female of *abnormis*, but both pairs of presutural dorso-centrals are present, the frons is narrower, and the orbits violet-coloured above, black below.

Orthellia nigriceps, Macquart.

This species, as recognized by Stein, has the frons in male about as wide as third antennal segment, which is distinctly wider than in *abnormis*; the thoracic chætotaxy as in that species except that usually all four pairs of postsutural dorso-centrals are distinguishable, and they are more nearly in the normal position and not closely placed posteriorly as in *abnormis*.

I have seen this species only from Australia, Queensland, and New South Wales.

Orthellia obscuripes, Stein.

Male.—Metallic blue-green, without pruinescence on dorsum. Legs black. Wings clear, yellowish at bases. Calyptræ yellowish. Knobs of halteres brownish.

Head broader than high in front; eye-facets very large on upper half; frons almost obliterated midway to ocelli, bare except on lower third. Thorax with two pairs of presutural dorso-centrals, and other two pairs in front of scutellum; no extra bristle between the acrostichals and dorso-centrals; scutellar bristles equally spaced; sterno-pleurals 1 : 3. Abdomen moderately stout, without a transverse series of distinct bristles on middle of fourth tergite. Fore tibia with the antero-dorsal setulæ rather pronounced; mid-tibia with a strong antero-dorsal bristle near apex; hind femur with a complete series of antero-ventral bristles, weaker basally, and some long fine bristles on basal half of postero-ventral surface; calcar moderate. Bend of fourth vein almost angulate.

Female.—As male, but the frons is nearly one-third of the head-width; orbits bluish green, whitish pruinescent on lower half, with no strong forwardly-directed bristle; eye-facet normal.

Length 7–8 mm.

Localities. Buitenzorg, Java, vi. 1909 (*Bryant* and *Palmer*). Allotype, Philippine Islands (*B. Arce*). Described from Formosa.

Orthellia chalybea (Wiedemann).

A very beautiful violet-blue species without any pruinescence on dorsum. Of very robust habitus. Wiedemann's description is sufficiently clear to permit of the definite identification of the species.

Type habitat Java, from where I have seen it.

Orthellia claripennis, sp. n.

Very similar to *chalybea*, but the female differs in having the bases of wings as clear as the rest of wings, inner cross-vein more nearly below apex of first vein, posterior intra-alar bristle and prescutellar acrostichals absent, section of costa between apices of veins 3 and 4 about one-eighth as long as preceding section instead of one-fourth, and in being less robust.

Length 8 mm.

Type, India (*Cragg*).

Orthellia cæruleifrons (Macquart).

I identify as this species one female from Java, the type habitat, in the United States National Museum. The apex of first posterior cell is as in last species, and the inner cross-vein is almost below apex of first vein.

Orthellia semilutea, sp. n.

Male.—Colours as stated in key. Thorax faintly vittate. Calyptræ and halteres yellowish.

Eyes bare ; frons linear at middle. Only the prescutellar acrostichals present ; sterno-pleurals 1 : 3. Hind femur with long bristles on antero-ventral and basal half of postero-ventral surface ; hind tibia slightly curved, with 4–5 fine antero-ventral bristles, the usual irregular antero-dorsal setulæ, and the calcar short. Bend of fourth vein broadly rounded.

Length 7 mm.

Type, Tjibodas, Mt. Gede, Java (*Bryant* and *Palmer*), U.S. Nat. Mus.

Herewith I present a key to the species of *Pyrellia* and *Orthellia*, which have been so described that it is possible to include them. Those with the letter *O.* in front belong to *Orthellia*, the letter *P.* indicates the species belongs to *Pyrellia*, and the same letter in parenthesis indicates that the species has been listed by Stein as belonging to *Pyrellia*. I have very grave doubts if any of these last are really referable to *Pyrellia* :—

Key to Species.

1. Epistome very much produced, as long as remainder of head, as in the Syrphid genus *Rhingia*; palpi very long, dilated apically and furnished along their entire length with sparse

long hairs; thorax with one or two pairs of presutural dorso-central bristles, the posterior one very short or absent in male ..... *O. rhingiæformis*, Villeneuve.

Epistome not abnormally produced, or, if so, it is not as long as remainder of head, and there are no distinct presutural dorso-central bristles present.. 2.

2. Eyes very distinctly haired in both sexes ..... 3.

Eyes entirely bare or with very sparse hairs which are distinguishable only under a very high power lens ..... 7.

3. Costal margin of wings conspicuously blackened; abdomen blue ..... (*P.*) *hirticeps*, Stein.

Wings hyaline or yellowish, nowhere black ..... 4.

4. Apex of fourth abdominal tergite rufous. (*P.*) *anorufa*, Villeneuve.

Abdomen blue or green, nowhere rufous. 5.

5. Presutural dorso-central bristles lacking; only two pairs of distinct postsutural dorso-centrals present; epistome rather strikingly produced; palpi as in *rhingiæformis* ..... *O. cyanea*, F.

Presutural dorso-central bristles distinctly present, two pairs ..... 6.

6. Three pairs of postsutural dorso-central bristles ..... (*P.*) *bequaerti*, Villeneuve.

Four pairs of postsutural dorso-centrals; no setulose hairs on lower margin of declivous part of thorax in front of scutellum ..... *P. albocuprea*, Villeneuve.

7. Wings marked with black or brown, the markings conspicuous ..... 8.

Wings hyaline, sometimes with a faint fuscous clouding at extreme bases .. 10.

8. Abdomen testaceous; thorax and abdomen with dorsum punctate ..... *O. aurantiaca*, Villeneuve.

Abdomen blue or green, at most with small portion rufous ..... 9.

9. Costa of wings with two elongate fuscous marks, one in the subcostal cell and the other extending from beyond apex of first vein to beyond apex of second; antennæ and palpi rufous yellow .... *O. bimaculata*, Stein.

Costa blackened from base to apex of second vein, without a break at apex of first vein; antennæ and palpi black. 9*a*.

9*a*. Dorsum of abdomen and thorax with dense setigerous punctures; thoracic dorso-centrals 0+1 ..... *O. limbata*, Villeneuve.

Dorsum of thorax and abdomen not punctate; thoracic dorso-centrals 2+2 or 2+3 ..... *O. marginipennis*, Stein.

10. Thorax with but one pair of presutural dorso-centrals, which are very strong . 11.

Thorax with either two pairs of distinct presutural dorso-centrals or none .... 12.

11. Hind femur in both sexes with one or two long fine bristles at base on postero-ventral surface; the two prescutellar pairs of dorso-centrals long and strong, the other two pairs almost indistinguishable, microscopic ..... *O. abnormis*, sp. n.

Hind femur in both sexes with more numerous and longer bristles on basal half of postero-ventral surface, especially in the male; the antero-ventral bristles also very noticeable in this sex; usually all four pairs of dorso-centrals behind the suture distinct, though the anterior two pairs are rather short ..... (*P.*) *nigricrus*, Macquart.

12. Two or more distinct pairs of dorso-centrals in front of suture on thorax.. 13.

No well-developed presutural dorso-centrals on thorax ..... 24.

13. Thorax with one very strong pair of presutural acrostichal bristles ..... *O. cæsarion*, Meigen.

Thorax without any strong presutural acrostichals ..... 14.

14. Thorax black, anterior spiracle, tip of scutellum, abdomen except apex, and the legs tawny yellow; dorso-central bristles very strong (2+4) ..... *O. semilutea*, sp. n.

Thorax and abdomen blue or blue-green, nowhere yellow; legs black ..... 14*a*.

14*a*. Halteres black or black-brown; anterior two pairs of postsutural dorso-centrals very short or absent ..... 15.

Halteres yellow, if obscurely brownish, the anterior two pairs of postsuturals are well developed and rather large .. 16.

15. Frons of female comparatively narrow, not one-third of the head-width; orbits glossy on almost their entire length, black below, violet-coloured above ..... *O. nigrohalterata*, Stein.

Frons of female one-third of the head-width; orbits subopaque except above, where they are greenish or bluish green ..... 15*a*.

15*a*. Calyptræ entirely or almost entirely white ..... *O. latifrons*, sp. n.

Lower calyptra in female largely brownish ..... *O. siamensis*, sp. n.

16. Upper calyptra blackish, with white marginal spots ..... (*P.*) *maculisquama*, Villeneuve.

Upper calyptra not white-spotted on margins ..... 17.

17. Mid-tibia with a moderately strong antero-dorsal bristle beyond middle;

facets of upper half of eyes of male very much enlarged ..... *O. obscuripes*, Stein.
Mid-tibiæ without any median anterodorsal bristle ..... 18.

18. Thorax with three pairs of long postsutural dorso-central bristles; eyes of male separated by about twice the width of third antennal segment; femora blue or greenish ..... *O. albipeus*, Stein.
Thorax with four pairs of postsutural dorso-centrals, the anterior two pairs sometimes very short, if an aberrant specimen has three pairs, the femora are black ..... 19.

19. Eyes of male separated by about twice the width of third antennal segment; fourth abdominal tergite in both sexes with a transverse median series of outstanding bristles ..... (*P.*) *lævifrons*, Villeneuve
Eyes of male separated by less than twice the width of third antennal segment, or the fourth tergite has no median transverse series of outstanding bristles ..... 20.

20. Orbits of female with at least one outstanding proclinate bristle above ..... 20*a*.
Orbits of female without such bristle .. 21.

20*a*. All dorsum entirely blue ..... *O. xanthera*, Bigot.
Abdomen blue, apical tergite brassy or golden ..... *O. auropygia*, sp. n.

21. All four pairs of postsutural dorso-central bristles long; fourth tergite as in *lævifrons* ..... (*P.*) *arctifrons*, Stein.
Anterior two pairs of postsutural dorso-centrals much shorter than the others; fourth abdominal tergite without median bristles ..... 22.

22. Hind tarsus of male with the two basal segments furnished with conspicuous dense reddish hairs or setæ below .. (*P.*) *tarsalis*, Villeneuve.
Hind tarsus of male without conspicuous reddish setulæ below ..... 23.

23. No setulose hairs on the lower margin of declivous part of thorax in front of base of scutellum; orbits black ..... *P. subcærulea*, L.
Numerous setulose hairs about lower margin of the declivous part of thorax in front of base of scutellum ..... 23*a*.

23*a*. Orbits in both sexes blue or green; eyefacets not much enlarged on upper half of eye in male ..... *O. cornicina*, F.
Orbits in both sexes shining black; eyefacets in male very much enlarged on upper half of eye ..... *O. diffidens*, Walker.

24. Both sexes with a strong forwardly-directed bristle on each orbit above

middle; those of male much wider than third antennal segment, thorax without a patch of white pruinescence in middle of front ..... (*P.*) *orbitalis*, Stein.

Neither sex with a strong forwardly-directed bristle on orbits above middle; frons of male not wider than third antennal segment, eye-bristle in same sex usually much colored above .... 25.

18. Dorsum of thorax and abdomen covered with minute subshining punctures ..... 19.

Dorsum of thorax and abdomen not punctate ..... 20.

20. a Eyes of male with the facets of upper half in front very conspicuously enlarged; abdomen rufous yellow ..... (*E.*) *rufiventris*, Townsend.

Eyes of male with the facets of upper half in front but little enlarged; abdomen metallic blue ..... (*E.*) *metallica*, Loew.

21. a Only one pair of distinct frontal bristles present, that in front of ocellus ..... 23.

At least two pairs of distinct frontal bristles in front of ocellus ..... 22.

22. Base of wing conspicuously darkened to beyond humeral and basal spines of basicosta; calypter and halteres fuscous; one pair of presutural acrostichal and one pair of intra-alars present ... (*L.*) *cingulata*, Wiedemann.

Bases of wings not darker than remainder of wings ..... 27.

23. Presutural acrostichals and posterior intra-alar bristles absent; calypter and halteres fuscous ..... (*L.*) *compressa*, sp. n.

Presutural acrostichals and posterior intra-alar bristles present; calypter and halteres pale whitish ..... (*L.*) *metallifrons*, Macquart.

Presutural acrostichals and posterior intra-alar bristle present; calypter yellow; halteres black ..... *Lucilia*, sp. n.

24. Antennæ, palpi, and face rufous yellow; lower calypter black except base .... (*L.*) *rufifrons*, sp. n.

Face black ..... 25.

25. Thorax with a conspicuous patch of white pruinescence in middle of front margin; abdomen without dark marks at base of tergites ..... (*L.*) *pyrenaica*, Adams.

Thorax without a white mark as above. 26.

26. Abdominal tergites 2 and 3 each with a black transverse mark at base on each side, like two transverse spots ... (*L.*) *bazini*, Wiedemann.

Abdomen without such luminous marks. (*L.*) *sylvarum*, sp. n.

N. B.—As the above key is drawn up from descriptions in the case of all species in which the generic name is in parenthesis, care must be exercised in using it to prevent errors in identifications.

Genus Morellia, R. D.

I present herewith a key to the species of the genus *Morellia*, which have been so thoroughly described that it is possible to ascertain their specific characters with something approaching certainty. In this key are included all the species that I have been able to examine from North America, Europe, and Africa. It is based largely on males, as many species before me are not represented by females.

Key to Species.

1. Thorax black or blue, abdomen yellow entirely or in part ..... 2.
   Thorax and abdomen black or blue-black, nowhere yellow ..... 3.
2. Thorax highly polished, violet-blue, without evident pruinescence; hind femur with three or four long bristles on apical half of antero- and postero-ventral surfaces (Africa) ..... *bicolor*, Stein.
   Thorax black, with a bluish tinge, and a whitish-pruinescent median vitta in front; hind femur with bristles only on apical part of antero-ventral surface (Africa) .. *abdominalis*, Stein.
3. Male with a straight downwardly-directed spine near base on ventral surface of hind femur (Africa) ..... *spinuligera*, Stein.
   Male without such a bristle ..... 4.
4. Thorax and abdomen brilliant metallic blue or blue-green, the former with the presutural dorso-centrals distinct but not strong, median and lateral stripes of whitish pruinescence which are visible only when seen from behind, and the abdomen with a spot of white pruinescence on each side visible from above; the other tergites whitish pruinescent on the parts incurved below, sternites also white pruinescent (East Indies) ..... *cyanicolor*, Stein.
   Thorax and abdomen black or blue-black, with much more conspicuous pruinescent markings ..... 4 *a*.
4 *a*. Presutural dorso-central bristles absent, or indistinguishable from the adjacent fine hairs ..... 5.
   Presutural dorso-centrals well developed and readily distinguished from the fine hairs ..... 7.
5. Lower calyptra with its apical half black, including the margin and fringe; fore tibia with a strong median posterior bristle (Africa) ..... *prolectata*, Walker.
   Lower calyptra yellowish, if infuscated the fringe and margin are white; fore tibia

	with at most a fine setulose hair on posterior surface at middle	6.
6.	Hind tibia much curved, with a series of fine hairs on entire length of antero-dorsal surface in male, three or four of which are conspicuously longer than the others; antero-ventral surface with five or six long setulose hairs on apical half, postero-ventral surface with a rather dense series of short setulæ on apical half (Africa)	*curvitibia*, Stein.
	Hind tibia not noticeably curved, with a series of setulæ on antero-dorsal surface which become longer apically (Africa)..	*calyptra*, Stein.
7.	Hind tibia much curved; basal segment of hind tarsus with very dense short setulæ forming a brush along the inner side and giving the segment the appearance of being thickened (Europe)	*ænescens*, R. D.
	Hind tibia almost straight; all segments of hind tarsi with setulose hairs on anterior side which are longer than diameter of tarsal segments (North America)	*micans*, Loew.
	Hind tibia almost straight; hind tarsus with the posterior side of basal segment bristled on its entire length, the bristles about twice as long as diameter of segment (India)	*sordidisquama*, Stein.
	Hind tibia straight; hind tarsi normal ..	8.
8.	Fore tibia with dense hairs on ventral surfaces and four or five long bristles in a series on postero-dorsal surface (Europe).	*hortorum*, Fallen.
	Fore tibia not so armed, without distinct bristles on postero-dorsal surface	9.
9.	Mid-tibia constricted at base, with a slight tubercle at apex of the constriction on antero-dorsal side, which is covered with dense short black spinules; tip of mid-femur crowned with dense strong bristles; fore tibia with a series of five or more long postero-ventral bristles on apical half (Europe)	*podagrica*, Loew.
	Mid-tibia not constricted nor so armed at base; bristles at apex of mid-femur not conspicuous; fore tibia without long postero-ventral bristles on apical half ..	10.
10.	Mid-tibia with three or more postero-ventral bristles, the one nearest apex not much longer than the one next to it; hind tibia with fine erect hairs on apical half of postero-ventral and ventral surfaces which are longer than the diameter of tibia; apical half of antero-ventral surface with about six equally long bristles that greatly exceed in length the diameter of tibia (Europe)	*simplex*, Loew.
	Mid-tibia with one postero-ventral bristle	

beyond middle which is much longer than the one next to it, the latter on posterior surface; hind tibia without fine erect hairs on ventral surfaces, the five or six antero-ventral bristles becoming longer apically, the longest not much longer than the diameter of tibia (East Indies, Sokotra) ..... *hortensis*, Wiedemann.

In this paper I describe one of Walker's species which has not been described sufficiently well to insure its identification.

Morellia prolectata (Walker).

Male.—Blue-black, shining. Head black. Thoracic dorsum with white pruinescence in the form of vittæ as follows; a complete one in centre, a broad one along margin from humeri to suture, and a narrower one behind suture and between the supra-alar and dorso-central bristles; a white mark along each side of scutellum; pleuræ largely whitish pruinescent. Abdomen with large white pruinescent markings on anterior margins of tergites. Legs black. Wings greyish. Calyptræ white at bases, apical half of lower one including the margins and fringes fuscous. Halteres yellow.

Narrowest part of frons not as wide as third antennal segment. Presutural dorso-centrals absent, two strong and one weak pair in front of scutellum; prosternum hairy. Second abdominal sternite with about 4 strong bristles at apex. Fore tibia with a series of short antero-dorsal setulæ, and beyond middle a strong posterior bristle; mid-femur slightly concave above near apex and with about 8 very strong bristles at tip above, 5 of them quite long; mid-tibia with a rather inconspicuous comb of setulæ at base on anterior surface, a series of short setulæ on postero-dorsal and 3 or 4 irregular strong postero-ventral bristles; hind femur with a complete series of fine bristles on antero-ventral surface, only the apical two or three elongated, and some similar bristles on basal half of postero-ventral surface; hind tibia very slightly curved, calcar long, one or two fine setulæ on postero-dorsal surface, antero-dorsal surface with the setulæ not close and quite fine, antero-ventral surface with 3 or 4 fine setulæ; tarsi normal. Wings normal.

Length 7 mm.

Locality. Mt. Mlanje, Nyasaland, 20–22. viii. 1913 (*S. A. Neave*).

Evidently a true *Morellia* despite the haired prosternum.

Morellia hortensis (Wiedemann).

A smaller and paler species than the last, with bare prosteruum.

I have before me four specimens from the Island of Sokotra, taken at elevations of 2500 and 3500 feet (*W. R. O.-Grant*).

South American Species of Morellia.

All the South American species recorded under *Pyrellia* by Stein evidently belong to *Morellia*. All of these species known to me have the abdomen brilliant metallic blue or green without any trace of the pruinescent markings so characteristic of the Palæarctic and African species, and the thorax is of the same colour, but with faint whitish pruinescence usually in the form of vittæ, at least anteriorly. The antennæ and palpi and sometimes part of the face and frons are usually yellowish.

In only one species have I seen what may be mistaken for the strong ventral bristle of the mid-tibia which distinguishes *Pyrellia* and *Orthellia*, but a careful examination discloses the fact that it is not on the ventral surface but on the postero-ventral, and is the same as that which occurs in both sexes of *hortensis*, Wiedemann, and the females of some other species. All the species but two have the presutural dorso-central bristles undeveloped as in the African species.

Some of the species have the prosternum hairy, and most of them possess weak setulose hairs along the posterior side of the base of first vein below.

Townsend has placed *violacea*, F., in a new genus *Parapyrellia*, but I can see no reasonable excuse for adopting this course.

Key to Species.

1. Humeri entirely yellowish, contrasting sharply with the blue or green colour of the remainder of the thorax ..... 2.
   Humeri blue or green, similar to remainder of thorax ..... 3.
2. Wings unspotted; mid-tibia of male sharply constricted at extreme base, slightly tuberculate on anterior surface just beyond constriction, and furnished with about 8 short spinules in a series on the swollen part; hind tibia of male with about 8 long fine bristles on antero-ventral surface, the other ventral surfaces bare ..... *scapulata*, Bigot.

Wings with a brown cloud along costa, interrupted at base of costal cell and again beyond apex of first vein; mid-tibia of male normal at base; hind tibia with rather dense soft hairs on ventral surfaces, besides a series of fine bristles on antero-ventral surface ..... *humeralis*, Stein.

3. Wings hyaline; inner cross-vein distinctly clouded ..... *ochricornis*, Wiedemann.

Wings entirely hyaline, even the inner cross-vein unclouded ..... 7.

Wings more or less conspicuously spotted or clouded ..... 4.

4. Third wing-vein with the setulæ on upper side confined to base of vein; the dark spot on inner cross-vein continued for some distance along fourth vein; outer cross-vein in male not, in female slightly margined with brown ..... *nitida*, Stein.

Setulæ on third wing-vein continued at least to inner cross-vein on its upper side; the cloud on inner cross-vein not continued along fourth vein ..... 5.

5. Apex of second vein and outer cross-vein clouded; legs black ..... *violacea*, F.

Apex of second vein and outer cross-vein not clouded ..... 6.

6. Wings browned from base to apex of costal cell along costa, the brown colour connected with a dark cloud over the inner cross-vein; mid and hind tarsi yellowish ..... *semimarginata*, Stein.

Wings with only a small spot at base and another in subcostal cell brown; all tarsi black ..... *bipuncta*, Wiedemann.

7. First wing-vein without bristles opposite humeral vein; antennæ and palpi orange-coloured; hind femur with long bristles confined to apical half of antero-ventral surface..... *ochrifacies*, Rondani.

First wing-vein with one very long fine bristle and some short setulæ on its posterior side opposite humeral vein; antennæ fuscous, palpi orange, darker at bases; hind femur with long bristles on almost the entire length of both antero-ventral and postero-ventral surfaces ..... [et sp. n. *Xenomorellia holti*, gen.

Specimens of *violacea*, *ochrifacies*, *scapulata*, and *holti* have been deposited in the British Museum (Natural History).

Genus Xenomorellia, nov.

Generic Characters.—Similar to *Morellia*, but distinguished from it by the very striking bristling of the first vein of the wing, as stated in the above key.

Genotype, the following species.

Xenomorellia holti, sp. n.

Male and *Female*.—Metallic blue-green, the head black; dorsum of thorax with rather slight whitish pruinescence, forming vittæ as usual in *Morellia*. Antennæ fuscous, arista orange at base; palpi orange, darker basally. Apical tergite of abdomen with very slight white pruinescence. Wings greyish, darker at bases. Calyptræ and halteres fuscous.

Eyes almost bare, in male separated by less than width of third antennal segment, in female by one-third of the head-width; orbits of female without strong forwardly-directed bristle. Thorax with 2+4 dorso-centrals and two pairs of intra-alars. Mid-tibia of male with fine short erect hairs on anterior side, of both sexes with several irregular bristles on posterior side; hind femur with bristles on almost the entire length of antero- and postero-ventral surfaces, very long in male; hind tibia of male with numerous long ventral hairs, a series of very long slender bristles on antero-ventral surface, and the antero-dorsal surface with irregular short bristles; calcar short; the female lacks the fine hairs and has the bristles shorter. Venation as *Morellia*.

Length 7–8 mm.

Type, female, South-east Peru, Alto Itatiaya, Serre do Itatiaya, 18. ii. 1922 (*E. G. Holt*). Allotype and three female paratypes, Peru, Paltaybamba, 5000 feet (Yale Peruv. Exped.).

Named in honour of the collector of the type-specimen.

Genus Pyrellina, nov.

Generic Characters.—Similar to *Dasyphora*, R. D., in general habitus. As in that genus, the first vein and also the third are setulose above and below, but the auxiliary vein is more abruptly bent forward at its apex, joining the costa at almost a right angle; the basal section of fourth vein is finely setulose below; each orbit has a strong forwardly-directed bristle above middle that is lacking in *Dasyphora*, and the declivous portion of the mesonotum in front of scutellum is not haired. The presence of fine hairs on the prosternum is another character which distinguishes the genus from not only *Dasyphora*, but from most of the allied genera.

Genotype, *Lucilia inventrix*, Walker (*Ochromyia hemichlora*, Bigot).

Besides the genotype there is another described species and two evidently undescribed that belong to this genus. They may be distinguished as below.

Key to Species.

1.	Thorax and abdomen entirely metallic blue-green; legs black	*unicolor*, sp. n.
	At least the abdomen partly reddish or yellowish	2.
2.	Thorax fulvous, dorsum densely and broadly white pruinescent anteriorly, posteriorly bluish, with four blue vittæ; legs fulvous-yellow, tarsi black	*versatilis*, Villeneuve.
	Thorax entirely blue or blue-green, with a white pruinescent spot in middle of front margin on dorsum; legs black, tibiæ sometimes paler	3.
3.	Entire abdomen fulvous-yellow	*inventrix*, Walker.
	Abdomen blue, fourth tergite reddish	*ruficauda*, sp. n.

Pyrellina unicolor, sp. n.

Male.—Uniformly metallic blue-green; thorax with a white-pruinescent spot in middle of front margin on dorsum. Antennæ and palpi black. Legs black. Wings slightly brownish. Calyptræ whitish. Knobs of halteres white.

Structurally and in chætotaxy as *inventrix*; sterno-pleurals 1 : 3.

Female.—Differs from the male in being deep blue and in having the palpi much wider. The white pruinescence on pleura is much more dense and distinct, the outer cross-vein of the wing is a little nearer the bend than to the inner cross-vein, and the frons is about one-third of the head-width, with the bristles strong and long, the forwardly-directed one especially so.

Length 7–8 mm.

Type, Gold Coast, Aburi (*W. H. Patterson*). Allotype and one male paratype without head, Gold Coast (*W. P. Lowe*).

Pyrellina ruficauda, sp. n.

Male and *Female*.—Violet-blue, thorax with a white spot of pruinescence in middle of dorsum in front. Fourth visible tergite rufous, with a violet tinge at base. Head and legs black. Wings slightly smoky. Calyptræ greyish, margins brownish. Halteres pale yellow.

Eyes bare as in the other species, the forwardly-directed bristle on each orbit strong. Thoracic chætotaxy normal, the dorso-central bristles 2 + 4 as usual, both intra-alars strong; sterno-pleurals 1 : 4 or 1 : 5. Hind tibia as in the other species, with distinct postero-dorsal bristle, two or three antero-dorsal and three or four antero-ventral bristles.

Length 9–11 mm.

Type, male, allotype, and six female paratypes, south-east edge of Kenia Forest, 5000–6000 feet, 7. ii. 1911; four female paratypes, 5 to 7 miles into Kenia Forest, near Luchi River, 9–10. ii. 1911 (*T. J. Anderson*).

In colour this species closely resembles *Orthellia anorufa*, Villeneuve, but that species has the eyes hairy and differs in some other characters.

Genus Dasymorellia, nov.

Generic Characters.—Eyes hairy; thorax with two pairs of strong presutural acrostichal bristles. In other respects as *Morellia*, R. D.

Genotype, *Dasymorellia trichops*, sp. n.

This genus was described by Stein as *Trichomorellia* in 1920, but he cited as the genotype *Curtoneura cyanea*, Macquart, a species which belongs to the genus *Myiospila*, R. D. Brauer had correctly named this species in the collection of the Vienna Museum as pointed out by Stein, but the latter refused to consider his identification as correct, and evidently erroneously identified the present species as Macquart's. In consequence of this error his generic name *Trichomorellia* has as its genotype *cyanea*, Macquart, and is a synonym of *Myiospila*, to which the genotype belongs.

This therefore leaves the present genus and species without names.

Dasymorellia trichops, sp. n.

Syn. *Trichomorellia cyanea*, Stein, nec *Curtoneura cyanea*, Macquart.

Head and thorax black, the latter shining, tinged with bluish, the dorsum with pruinescent vittæ anteriorly as in most species of *Morellia*. Abdomen metallic blue, with very distinct whitish-pruinescent checked rings as in *Calliphora* species. Legs black. Wings clear, veins black. Upper calyptra and base of lower white, apical portion of lower, including the fringes, fuscous. Halteres fuscous.

Frons in male not wider than third antennal segment, in female nearly one-third of the head-width; orbits in male with long setulæ on their entire length, in female with a strong bristle above middle which is directed forward. Thoracic dorsum with fine erect hairs, two pairs of prosutural acrostichals, and two presutural and four pairs of postsutural dorso-central bristles. Fore tibia unarmed at middle; mid-tibia with short, fine, erect hairs on anterior side in male and a double series of bristles on posterior side in both sexes; hind femur with the bristles on basal half of antero-ventral surface short and fine, long and strong on apical half,

the postero-ventral surface with some long bristles on basal half; hind tibia with two postero-dorsal bristles, one setula at middle on postero-ventral surface, five or six bristles on antero-ventral surface, and the antero-dorsal surface with a series of bristles of unequal lengths. The wing-venation as in *Morellia*.

Length 6–7 mm.

Type, allotype, and a large number of paratypes, Ollantaybamba and Paltaybamba, Peru, at various altitudes up to 9000 feet, 1911 (Yale Peruvian Expedition). Other paratypes, Peru (*Parish*). In collection of United States National Museum. Paratypes deposited in British Museum (Natural History).

Graphomyia eustolia (Walker).

Originally described as a *Musca*, and later under the name *Spilogaster trivittata* by Stein.

From the genotype of *Graphomyia* it differs in having the anterior sterno-pleural bristle present, and the fourth vein much less approximated to tip of third. The thorax has three broad velvety-black vittæ on a whitish-yellow ground, the abdomen is yellowish, with large black markings on the apices of the apical two tergites, and the legs are tawny, with the tibiæ darker and the tarsi black.

The eyes are bare, entire on hind margin, and the hind femur in male has a closely-placed series of short black bristles on apical third of antero- and postero-ventral surface which are absent in female.

Length 6–7 mm.

Six specimens from Blantyre and Mt. Mlanje, Nyasaland.

LI.—*Some new Long-horned Grasshoppers from Ceylon* (*Orthoptera*, Tettigoniidæ). By B. P. Uvarov, F.E.S.

The following new Tettigoniidæ have been found by me in the collection of Ceylonese Orthoptera presented by Mr. E. E. Green to the Imperial Bureau of Entomology; the whole collection, including all types, has been handed over to the British Museum.

Subfamily *Phaneropterinæ*.

1. *Condylodera fumosa*, sp. n. (Fig. 1, A.)

♀. General coloration brown. Head and pronotum rugosely punctured, postocular fasciæ and pronotal carinæ

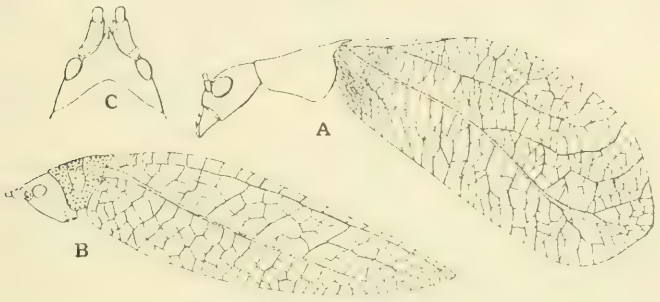
black. Elytra very broad, with the apex very broadly rounded; their underside reddish, with black marmoration. Wings scarcely longer than the elytra, strongly infumated. Front femora with two spinules near the apex on the lower outer carina. Hind femora with six outer and four inner spinules beneath. All tarsi and the front tibiæ at the auditory foramina black. Abdomen black, with red rings. Ovipositor strongly recurved, short, broad.

Length of body 26 mm.; pronotum 9; elytra 31; maximal width of elytra 15; hind femur 18·5; ovipositor 11.

Kandy, v. and vi. 1907; 2 ♀ ♀.

This is the third known species of the genus *Condylodera*, West. (=*Leptodera*, Br. W.*), and the second one described

Fig. 1.



A. *Condylodera fumosa*, sp. n., ♀. × 1½.
B. *Brunneriana signatipes*, sp. n., ♀. × 1½.
C. *Brunneriana signatipes*, sp. n., ♀. × 3.

from Ceylon. It differs from another Ceylonese species—*C. flavifrons*, Br. W.—by its coloration, especially that of the abdomen, wings, and legs, as well as by its very broad and rounded elytra.

The collection contains, in addition, one larva, also taken at Kandy, vi. 1905, which belongs probably to this species (and not to *C. flavipennis*, as recorded in my paper quoted above), and resembles the Cicindelid beetle *Tricondyla granulifera*, Motsch., in general shape, coloration, and sculpturation.

Subfamily *Listroscelinæ*.

2. *Xiphidiopsis forficula*, sp. n. (Fig. 2, *a*, *b*, *c*.)

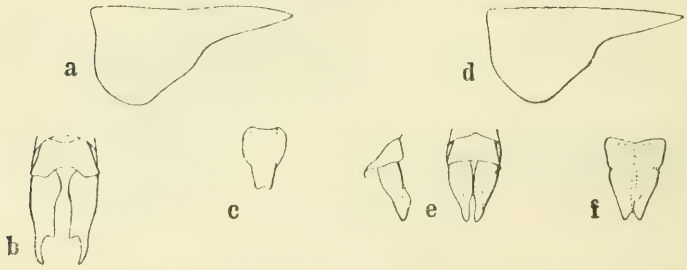
♂. Pale greenish ochraceous. Elytra in the apical half green, their veins raised. Pronotum smooth, shining; lateral

* Trans. Ent. Soc. London, 1922, pp. 269–274.

lobes rounded, not angulate below. Last tergite with a shallow and broad round emargination behind. Cerci long; expanded inwardly in the basal two-thirds, the apex of the expansion forming a tooth; the apical parts round, distinctly incurved (the whole reminiscent of the forceps of *Forficula*). Subgenital plate raised along the middle; hind margin broadly truncate, scarcely emarginate; styli short, but quite distinct.

♀ (paratype). — Subgenital plate transversely convex, almost cylindrical, in profile straight; the apex angulately emarginate; lobes short, rounded. Ovipositor in the apical half distinctly recurved; subapical emargination of its lower valva deep, semicircular.

Fig. 2.



a, b, c, Xiphidiopsis forficula, sp. n.: *a*, pronotum; *b*, male genitalia from above; *c*, female subgenital plate. *d, e, f, X. greeni*, sp. n.: *d*, pronotum; *e*, male genitalia in profile and from above; *f*, female subgenital plate. × 6.

Length of body, ♂ 12, ♀ 13 mm.; pronotum, ♂ 4·5, ♀ 5; elytra, ♂, 17·5; wings, ♂, 19; hind femur, ♂, 11; ovipositor, ♀, 6. (The female is not well preserved, and some of the dimensions cannot be taken.)

Described from one male from Kandy, vi. 1909, and one female from the same locality, x. 1907.

The shape of the pronotal lobes being identical in the two specimens and distinct from that in the next species, I consider them conspecific, though this requires corroboration.

3. *Xiphidiopsis greeni*, sp. n. (Fig. 2, *d, e, f.*)

Differs from the preceding species in the following characters:—Pronotal lobes obtusely angulate below, though the angle itself is rounded; last tergite of the male simply truncate,

not emarginate; male cerci expanded throughout, though the apical parts are narrower than the basal ones and separated from them by rounded angles; male subgenital plate with the hind margin broader and straight and the styli very small; female subgenital plate with its basal margin incrassate, impressed in the basal third, with a raised median keel which disappears in the moderately convex apical part, with the apex acutely emarginate and the lobes fairly long, rounded; ovipositor scarcely recurved, and its subapical emargination smaller and more shallow.

Length of body, ♂ (type) 11, ♀ 12 mm.; pronotum, ♂ ♀, 5; elytra, ♂ ♀, 16; wings, ♂ ♀, 18; hind femur, ♀ 10; ovipositor, ♀ 6·5.

The male type is from Kandy, x. 1907; two male paratypes, also from Kandy, vii. 1909 and 12. vi. 1910; five female paratypes from Peradeniya, vi. 1909–i. 1910.

In this case I again cannot be quite certain that the two sexes are conspecific, but they agree perfectly well in the shape of pronotal lobes.

Subfamily *Pseudophyllinæ*.

4. *Brunneriana* signatipes*, sp. n. (Fig. 1, B, C.)

♀. Of medium size. First antennal joint with the front inner angle attenuate, almost acute. Fastigium of vertex much longer than its basal breadth, reaching almost to the apex of the first antennal joint; antennal scrobæ reaching to its middle. Pronotum almost tectiform, though rounded and not carinated, covered with round tubercles, fairly dense on the upper surface, less so in the lateral lobes, the middle of which is smooth; the front margin rotundately prominent, its sides feebly sinuate, with small tubercles; lower margin with larger tubercles. Elytra as in *B. ceylonica*, Br. W., but the radial vein branched in the apical third, the branch being irregular, as are also the cells of the whole elytron. Wings slightly shorter than the elytra. Front femora very obtusely serrate beneath. Middle femora with a few obtuse teeth beneath. Hind femora denticulate beneath on both sides, though less strongly on the inner side. Supra-anal plate

* *Brunneriana*, nom. nov. for *Microprion*, Br. Watt., 1895 (not *Microprion*, Pict. & Sauss., 1892). The manuscript name *Microprion*, Redt., has been applied to two different genera by the above-named authors, and, as I cannot accept Kirby's view (Cat. ii. p. 301) that one of them may be called *Micropion*, Br. W. (an obvious misprint on p. 11 of Brunner's monograph, corrected on p. 61, where also the Greek derivation of the word *Microprion* is given), I propose a new name for the genus of Brunner.

tectiform, elongated, triangular. Subgenital plate convex, triangular, with the apex briefly emarginato-truncate. Ovipositor with the upper margin slightly sinuate at the base, straight and minutely serrate in the rest; the lower margin convex throughout, though not strongly.

General coloration pale greenish ochraceous. Face on its sides and the costal margin of elytra in its basal third whitish. Front coxæ beneath, apices of the front femora, and bases of the front tibiæ marked with black. Ovipositor ferruginous, with the disc pale.

Length of body 21·5 mm.; pronotum 6; elytra 31; maximum width of elytra 10; hind femora 12; ovipositor 15.

Described from a single female taken at Hakgalla, iii. 1907.

Apart from the morphological characters, this new species is easily recognized by the presence of black marks on the front legs.

LII.—*On a Case of probable Regeneration of a Leg in a Thysanopteron.* By Oscar John (Petrograd).

Among the material in the Zoological Museum of the Russian Academy of Sciences I found a specimen of some species of Thysanoptera which is remarkable for the abnormal size of its right fore leg. As similar facts have not, to my knowledge, yet been recorded for this order of insects, I venture to give here a brief description of this interesting case. For lack of literature I am, unfortunately, not in the position to give the exact name of the species; but this is of secondary importance with regard to the fact in question. All I can say is that it belongs to the subfamily Macrothripini, and is one of three specimens of the same species captured by Mr. von Wick on April 4th, 1913, at Beda, a place on or near the Dinder, a tributary of the Blue Nile.

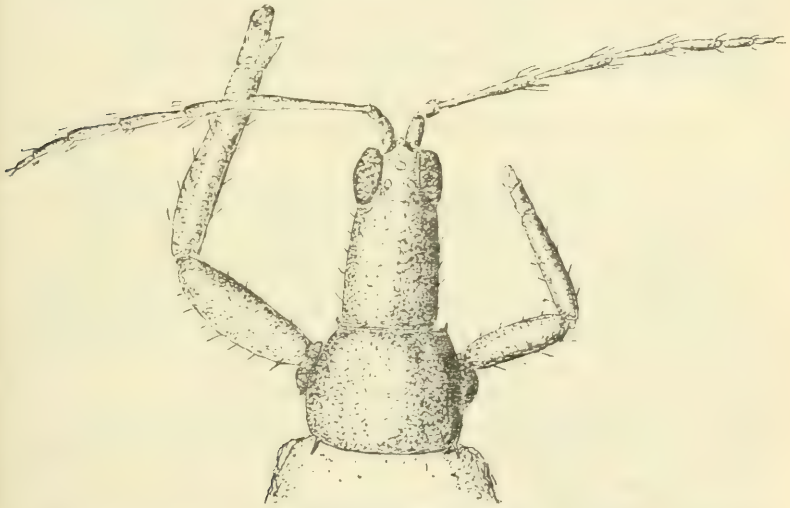
The said specimen is, on the whole, built quite normally, and only its right fore leg (with the exception of the coxa, which is of the ordinary size) is remarkable in being very small, so that it is only a little more than half the size of the left fore leg. The dimensions of the two fore legs are as follows:—

Left (normal) fore leg: femur, length 486 μ, width 162 μ; tibia, length 572 μ, width 97 μ; tarsus, length 129 μ, width 76 μ.

Right fore leg: femur, length 291 μ, width 92 μ; tibia, length 324 μ, width 86 μ; tarsus, length 86 μ, width 54 μ.

Though dwarfish, the right leg is not deformed, though there are some disproportions. Thus the relative proportion of the length to width of the tibia is about 1 : 6 in the left and 1 : 3·77 in the right, *i. e.* the tibia is much stouter in the abnormal leg. The comparative lengths of the tibia and femur are 1 : 1·18 and 1 : 1·11 respectively, so that the tibia of the abnormal leg is comparatively shorter than in the normal. Finally, the tarsal tooth is quite rudimentary in the right leg.

Considering that the abnormal leg, apart from its size, shows an almost normal development, I believe that the specimen in question must have lost by some accident its right fore leg, which was cut or torn off at the coxa. This must have



Fore part of a species of tubuliferous Thysanoptera, illustrating probable regeneration of right leg.

taken place at a very early stage of development, presumably before the first moult of the larval insect, so that the leg could regenerate—without, however, attaining the normal size. The experiments of W. Wagner * and E. Schultz † on the regeneration of the legs of spiders have shown that the regeneration is most complete when the leg is cut off at the coxa, as in this case, and perhaps this statement is also true for insects ‡. One could ascribe the above-stated case also to

* W. Wagner, Bull. Soc. Imp. Natur. Moscou, 1887.

† E. Schultz, Trav. Soc. Imp. Natur. St. Pétersb. 1898.

‡ This particularly applies to insects with incomplete metamorphosis, such as the Hemiptera, Thysanoptera, etc.

a growth-checking influence of some traumatic cause; but such a presumption seems to be less probable, as we should then expect rather a deformation of the leg than a mere reduction in size.

P.S.—The above note was already despatched for publication when I received a reprint of Dr. H. Karny's paper "Beiträge zur Malayischen Thysanopterenfauna, IV." ('Treubia,' II. i. 1921), not known to me when writing the above. On p. 65 this author figures and shortly describes a specimen of *Dicaiothrips dallatorrensis*, Schmutz, with a deformed right fore leg, considering it to be a case of regeneration. In this specimen of *Dicaiothrips* the tarsus is, to judge from the figure, wanting and the bladder-apparatus is fastened to the tibia. In this case the regeneration of the lost limb is therefore less complete than stated above.

LIII.—*On some small Mammals from Tanganyika Territory.*

By P. S. Kershaw.

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The mammals treated of in this paper were obtained in various localities in the Territory by collectors employed by Mr. Arthur Loveridge, Assistant Game Warden, and have been kindly presented by him to the British Museum. Mr. Loveridge has already discovered many new species in East Africa, and he is to be congratulated on securing yet three more.

Nycteris marica, sp. n.

A large bat, equal to *N. grandis* in size, but with a smaller skull.

Colour drab-grey above and below, rather darker in the posterior dorsal region. Wing-membranes broccoli-brown. Lower surface of wing-membranes on each side of the body thickly furred to a distance of about 20 mm. from the body.

In the skull the fourth lower premolar is much larger than in *grandis*, though not so large as in the *javanica* group.

Type. Adult. B.M. no. 23. 8. 2. 1. Collected on 24th Jan., 1922.

Type-locality. Tindiga, Kilosa.

Measurements from the dried skin:—

Forearm 60 mm.; head and body 93; tail 70; ear 27;

thumb 18·7 ; third finger, metacarp. 48, first ph. 32, second ph. 32 ; tibia and foot with claws 44.

Skull : greatest length to tip of canine 26 ; zygomatic breadth 16 ; breadth of frontal shield 10·2 ; p_4 comparatively large and standing in the tooth-row.

N. marica, a member of the *hispida* group, is, with *grandis*, larger than any other species in the genus. It differs from *grandis* in colour and in the smaller skull with the larger p_4.

Rattus (*Æthomys*) *chrysophilus singidæ*, subsp. n.

A light-coloured form with a comparatively short tail, as in *tzaneensis*.

Colour above ochraceous buff. Hairs of under surface white, with slaty bases.

Type. Adult female, with moderately worn teeth. B.M. no. 23. 8. 2. 2. Collected 10th Oct., 1921.

Type-locality. Gwao's, near Itigi, Singida, about 30° 40′ E., 4° 25′ S.

Dimensions of the type (taken in the flesh) :—

Head and body 143 mm. ; tail 163 ; hind foot 28 ; ear 20.

Skull : greatest length 35 ; condylo-incisive length 32 ; basilar length 27·5 ; interorbital breadth 5·2 ; nasals 13.

R. c. singidæ is the lightest-coloured form of *chrysophilus* hitherto described.

Steatomys muanzæ, sp. n.

A species with small ears and hind feet and narrow skull.

Colour of back greyish fawn. The hairs on the sides tipped with ochraceous. Under surface, hands, feet, and a spot below each ear pure white. Tail brown above, white beneath. Ears very small, little more than half the size of those of the large-eared *loveridgei*.

Skull narrow, with a somewhat high rounded brain-case.

Type. Adult male. B.M. no. 23. 8. 2. 3. Collected on 10th Nov., 1922.

Type-locality. Nyambita, Mwanza.

Dimensions (taken in the flesh) :—

Head and body 85 mm. ; tail 36 ; hind foot 13 ; ear 11.

Skull : greatest length 21·5 ; condylo-incisive length 19·5 ; zygomatic breadth 10 ; nasals 9 ; breadth of brain-case 10·3 ; palatilar length 9·5.

S. muanzæ seems to be most nearly related to *S. athi*.

Lemniscomys albolineatus, Osg.

In publishing some remarks on this species (Ann. & Mag. Nat. Hist. (9) xi. pp. 595 & 596, May 1923) I overlooked the fact that a topotype is in the possession of the United States National Museum. Since the British Museum acquired its specimen from Singida in the Tanganyika Territory a series of four more have been received from the same district. There seems to be no doubt, therefore, that this form should be recognized and, owing to the presence of other species in its area of distribution, be elevated into a distinct species.

LIV.—*The Synonymy of a Penæid Prawn,* Penæopsis philippii (*Spence Bate*). By W. T. Calman, D.Sc., F.R.S.

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While examining a collection of Macrura from South Africa, submitted by Dr. J. D. F. Gilchrist, I found it necessary to refer to the 'Challenger' types of the species mentioned below. A study of these leads me to believe that, as has already been suggested by others, such secondary sexual characters as those of the thelycum and of the modified flagellum of the male antennule are not invariable, even in well-grown and apparently adult specimens of this group. It appears possible that these characters may undergo seasonal or other periodic changes like those which, in some other Decapods, give rise to the phenomenon of "Alternating dimorphism," but the material examined is not large enough to demonstrate this.

The following synonymy is proposed :—

Penæopsis philippii (Spence Bate).

Penæus philippii, Spence Bate, Ann. & Mag. Nat. Hist. (5) viii. 1881, p. 181.

Penæus philippinensis, Spence Bate, Rep. Crust. Macrura 'Challenger,' 1888, p. 201, pl. xxxv. figs. 2 & 3.

Metapenæus philippinensis, var. *andamanensis*, Wood-Mason, Ann. & Mag. Nat. Hist. (6) viii. 1891, p. 271.

Peneus (*Metapeneus*) *coniger*, var. *andamanensis*, Alcock, Cat. Indian Deep-sea Macrura & Anomala Ind. Mus. 1901, p. 17.

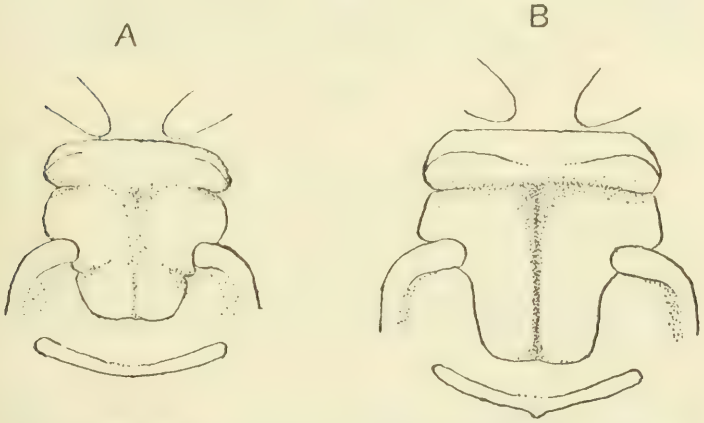
Metapeneus andamanensis ("Variety of *M. coniger*"), Alcock, Ann. & Mag. Nat. Hist. (7) xvi. 1905, p. 518.

Metapeneus coniger, var. *andamanensis*, Alcock, Cat. Indian Decapod Crust. Ind. Mus. Part III. fasc. 1, *Peneus*, 1906, p. 27, pl. iv. fig. 13.

Penæopsis coniger, var. *andamanensis*, de Man, Decap. Siboga Exp. pt. 1, Penæidæ, 1911, p. 61; Kemp & Sewell, Rec. Ind. Mus. vii. 1912, p. 16; Balss, Abh. math.-phys. Kl. K. Bayer. Akad. Wiss., Suppl. Bd. ii. Abh. 10, 1914, p. 8; Parisi, Atti Soc. Ital. Sci. Nat. lviii. 1919, p. 64, pl. v. fig. 7.

Dr. de Man has suggested (*op. cit.* p. 54, footnote) that Spence Bate's *P. philippinensis* is the species to which he had previously given the name *P. philippii*. This appears to be the case. *P. philippii* is stated to have been taken "off the Philippine Islands in about 100 fathoms of water." *P. philippinensis* is described in the 'Challenger' Report from specimens taken in 82 fathoms at a spot which is given as "among the Celebes Islands," but is actually off

Fig. 1.



Outline of thelycum in two syntypes of *Penæopsis philippii* (Spence Bate), from 'Challenger' Station 201.

Mindanao in the Philippines. One of the bottles containing specimens from this locality in the 'Challenger' collection still bears a label somewhat obscurely written in pencil which may be read as "*P. philippii*."

Wood-Mason gave the name *andamanensis* to a variety of *M. philippinensis*, describing at the same time a distinct but closely allied species *M. coniger*. Alcock transferred the variety *andamanensis* from *M. philippinensis* to *M. coniger*, distinguishing the latter species from the former by several characters, none of which appears to be shared by the variety, so that the reasons for the transference remain obscure. As

a matter of fact, I find Wood-Mason's variety indistinguishable from the types of *P. philippinensis*. It was originally stated to differ chiefly "in its much smaller size and in the median part of the *annulus ventralis* [or thelycum] being shorter and devoid of lateral notches." In the matter of size, later specimens recorded by Alcock give the advantage decisively to the variety *. Among the eleven female syntypes of *P. philippinensis* remaining in the 'Challenger' collection there is considerable diversity in the form of the thelycum. Only a single specimen (text-fig. 1, A) shows the "lateral notches" figured by Spence Bate, which Wood-Mason, and later de Man (*l. c.* p. 62), regarded as especially characteristic of the species. The median longitudinal groove and the anterior transverse groove may be narrow and deep (text-fig. 2, B), or shallow and broad, or even so slightly marked as to be hardly distinguishable, while the hind margin may be truncate (as in Parisi's figure) or

Fig. 2.

Outline of basal part of inner flagellum of antennule in a male of *P. philippii* from 'Challenger' Station 219. The very numerous setæ are omitted.

divided by a shallow notch into two rounded lobes (text-fig. 1, B). I have not found a specimen, however, with the lobes pointed as in Alcock's figure.

As regards the typical form of Wood-Mason's *M. coniger* the case is not so clear. Both Wood-Mason and Alcock lay stress on two characters as distinguishing the species from *M. philippinensis*, namely, the form of the inner flagellum of the antennules in the male and that of the thelycum in the female. Wood-Mason states that the flagellum "bears at its inner and upper margin near the base a short, stout, and highly indurated spine of a peculiar form, the part from which the spine springs being conically thickened and elevated, with its constituent joints firmly

* The largest surviving syntype of *P. philippinensis* measures 88 mm. in total length. Alcock states that the var. *andamanensis* may reach a length of 5¼ inches (133 mm.).

ankylosed together." In *M. philippinensis*, according to Alcock, "there is no tooth (though there is a slight concavity) near the base" of the flagellum. I find, however, that male syntypes of *M. philippinensis* (text-fig. 2) agree exactly with Wood-Mason's description, the concavity at the base of the flagellum ending distally in a prominence with partly coalesced segments, bearing a stout curved spine, bifid at the tip. More important is the character of the thelycum. Specimens received from the Indian Museum agree closely with the description of Wood-Mason and with the figure of Kemp and Sewell, and differ widely from all the specimens of *P. philippii* that I have examined. A character which Alcock in 1901 used to distinguish *P. coniger* from its variety *andamanensis* (*i. e.*, from *P. philippii*), is the shorter petasma, which is said to be about a third as long as the carapace in the former and at least half as long in the latter. In 1906, however, he does not mention this distinction, and in the specimens I have examined it is, at most, much less marked than is implied in the earlier description. I am inclined, for the present, to leave *P. coniger* apart as possibly a separate species, although I am unable to point to any distinctive characters except those of the thelycum.

Material examined.—'Challenger' collection: Stat. 192, Ki Ids., 140 fath., 2 ♂; Stat. 201, Basilan Strait, Mindanao, P.I., 82 fath., 9 ♀, ♂ (fragments); Stat. 219, Admiralty Ids., 150 fath. 7 ♂, 2 ♀. All these specimens must, I think, be regarded as syntypes of *P. philippinensis*, since, although the description is stated to have been drawn up from the specimens from Stat. 201, yet it is added that "it applies to all the adult forms." The specimens from Stat. 201 are also to be regarded as syntypes of *P. philippii*.

Marine Survey, India, Stat. 233, E. of N. Andaman Id., 185 fath., 1 ♂*.

Marine Survey, S. Africa. Off Natal, 191 fath., 3 ♂, 1 ♀.

[*P. coniger*, Marine Survey, India, Bay of Bengal, 100 fath., 1 ♂, 2 ♀.]

Further Distribution.—Japan: Sagami Bay, 120–150 metres (*Balss*); Okinose (*Parisi*).

* Alcock (1906, p. 27), apparently by inadvertance, indicates the specimens from this locality as "Types." Wood-Mason's specimens were from "North of Port Blair, Andaman Sea, in 112-244 fathoms," corresponding to the second lot of specimens in Alcock's list.

LV.—*A new Javan Fungus-feeding Gall-midge.*

By F. W. Edwards.

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Colomyia corticii, sp. n.

Colour uniformly pale whitish-ochreous, except for the eyes and the palpi, which are deep black. Structural characters agreeing rather closely with Kieffer's diagnosis of the genus *Colomyia*, except that the palpi are rather longer, exceeding the labium by the whole of the second (terminal) segment, which is fully twice as long as broad; the radio-cubital cross-vein (Kieffer's lower root of cubitus) is strongly arched, as in *Diallactes*; and the male claspers have a different structure. Eyes large and completely fused, without a trace of a division dorsally. Antennæ with a variable number of segments, from 26–30, the females having a few more segments than the males, though the number is not constant. Looped threads rather irregularly arranged, loops very short but distinct. Necks nearly as long as the segments in the ♂, a little shorter in the ♀. Empodia and pulvilli very short, about one-third as long as the claws; basal tooth about half as long as the claws and rather strongly recurved, almost at right angles to the claw. Male claspers rather short, tapering towards the tip, which is, however, somewhat flattened; no terminal claw, a few small setæ irregularly placed near the tip. Dorsal and ventral anal lamellæ both deeply bilobed.

Java: Tea Experimental Station, Buitenzorg (*Dr. R. Menzel*); reared from *Corticium* on tea-twigs. Co-types, 4 ♂, 3 ♀ in the British Museum.

Concerning the rearing of the species, Dr. Menzel writes as follows:—"The material that I am forwarding you was found in the interior of the cushions formed by a fungus—*Corticium* sp.—on tea-branches in West Java. Nearly every cushion contained the larvæ and pupæ of this fly. I have reared the imagines and photographed them in nature." Dr. Menzel enclosed a photograph showing three of the flies resting on the tea-twigs in a very peculiar position, the femora all held rather close together at right angles to the body, and the tibiæ and tarsi only diverging a little; the long antennæ thrown back over the wings.

LVI.—*Diagnoses of Species of* Pitymys *and* Microtus *occurring in the Upper Freshwater Bed of West Runton, Norfolk.*

By Martin A. C. Hinton.

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As some little time will necessarily elapse before the publication of my monograph of the Microtinæ, and as I am now returning, accurately labelled, much of the material entrusted to me for description, it seems advisable to publish the following diagnoses. All the forms diagnosed below are from the Upper Freshwater Bed (Cromerian), the type-locality in each case being West Runton, Norfolk.

Cheek-teeth rootless and persistently growing. Size throughout less than in living analogues.

a. m_1 with posterior loop, followed successively by three substantially closed and alternating triangles and a confluent pair of triangles, and terminated by an anterior loop of variable form ..... Genus Pitymys.

1. Anterior loop of m_1 resembling that of the m_1 of *M. arvalis* in form ..... *P. arvaloides*, sp. n.
2. Anterior loop of m_1 resembling that of the m_1 of *M. anglicus* ("*gregalis*") in form. *P. gregaloides*, sp. n.

b. m_1 with posterior loop followed by five (or four) substantially closed and alternating triangles and terminated by an anterior loop of variable form ..... Genus Microtus.

3. m_1 in adults agreeing in form with that of *M. arvalis*; its size somewhat less and showing ephemeral and unusual complications of the anterior loop in early stages of wear ..... *M. arvalinus*, sp. n.
4. m_1 with the anterior loop shortened, the fourth outer and fifth inner prisms somewhat reduced..... [Major. *M. nivaloides*, Forsyth
5. m_1 agreeing exactly in form and structure of anterior loop with recent *M. nivalis*. Size smaller ..... *M. nivalinus*, sp. n.
6. m_1 resembling that of *M. ratticeps*, but with the fourth outer prism less reduced, the fifth inner prism more reduced and the anterior loop shortened. Size smaller ..... *M. ratticepoides*, sp. n.

The types and synonymies (where they exist) of these species are as follows :—

1. *Pitymys arvaloides*, sp. n.

1882. *Arvicola arvalis*, Newton, Vert. Forest Bed, p. 88. pl. xiv. figs. 2 & 2*a* (not of Pallas, 1779).

1882. *Arvicola arvalis*, var. (? *A. nivalis*), Newton, *op. cit.* p. 90, pl. xiv. figs. 7 & 7 *a*.
1902. *Microtus* (*Pitymys*) sp., Forsyth Major, P. Z. S. 1902, **1**, p. 106, text-fig. 15, fig. 28.

Type. A right m_1. B.M. no. M. 6987 *d* (ex Savin Collection). Figured by Forsyth Major (*loc. cit.*).

2. *Pitymys gregaloides*, sp. n.

1882. *Arvicola gregalis*, Newton, Vert. Forest Bed, p. 90, pl. xiv. figs. 6 & 6 *a* (not of Pallas, 1779).

Type. An imperfect left mandibular ramus, with the incisor, m_1, and m_2 in place. B.M. no. M. 12345 ; collected and presented by M. A. C. Hinton.

3. *Microtus arvalinus*, sp. n.

1902. *Microtus* sp., recalling *M. arvalis*, Forsyth Major, P. Z. S. 1902, **1**, p. 106, text-fig. 15, fig. 27.

Type. A left m_1. B.M. no. M. 6987 *c* (ex Savin Collection). Figured by Forsyth Major (*loc. cit.*).

4. *Microtus nivaloides*, Forsyth Major.

1902. *Microtus nivaloides*, Forsyth Major, P. Z. S. 1902, **1**, p. 106, text-fig. 15, fig. 19.

Type. A left m_1. B.M. no. M. 6987 *b* (ex Savin Collection, no. 1708).

5. *Microtus nivalinus*, sp. n.

Type. Part of a left mandibular ramus with the m_1 in place. Savin private collection. Temporary number 8.16.

6. *Microtus ratticepoides*, sp. n.

Type. A right m_1. B.M. no. M. 6987 (ex Savin Collection).

BIBLIOGRAPHICAL NOTICE.

A Bibliography of British Ornithology from its Earliest Times.—Supplement. *A Chronological List of British Birds.* By H. Kirke Swann. Pp. xvii + 42. 8vo. London: Wheldon and Wesley, 1923. Price 5*s.*

A few years ago Major W. H. Mullens and Mr. Kirke Swann published a most useful bibliography of British ornithology, enumerating all the works on British birds which had appeared from the earliest times and giving valuable biographical notes on the principal

writers. Mr. Swann has followed this up with a list of the specific and generic names used for British birds, arranged in chronological order from 1758 (when Linnæus's tenth edition was published) up to 1923.

The genera and species are arranged in separate lists, the former commencing with *Falco*, the first genus of birds in the 'Systema,' and ending with *Plectrophenax*, proposed by Stejneger in 1882 for the snow-bunting. Out of sixty-three genera given by Linnæus to the birds of the world in the tenth edition, forty four are now in use for British birds.

The list of species and subspecies follow, again beginning with Linnæus's *percnopterus* for the Egyptian vulture, and ending with the southern guillemot, which was provided with a new subspecific name—*albionis*—a few weeks ago by Mr. Witherby. In the case of the genera the origin of the name is given either as having been derived from one of the older pre-Linnean authors, or, if original, the probable derivation.

The nomenclature is based on the 'Hand-list of British Birds' published in 1912 by Hartert, Jourdain, Ticehurst, and Witherby, with such additions and emendations as are necessary to bring the work up to date.

So far as can be tested, there seem to be few misprints, and the list will doubtless prove of value to working ornithologists and others interested in zoological nomenclature.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 6th, 1923.—Prof. W. W. Watts, Sc.D., F.R.S., Vice-President, in the Chair.

The following communication was read:—

'On a New Blattoid Wing from the Harrow Hill Mine, Drybrook (Forest of Dean).' By Herbert Bolton, D.Sc., F.R.S.E., F.G.S.

The Author describes a new type of fossil insect-wing found in shale on the waste-heap at the Harrow Hill Mine, and since recognized as being derived from the roof of the Coleford High Delf Seam. The specimen was discovered by students of the Imperial College of Science & Technology in the summer excursion of 1921.

The wing is a right fore-wing of a new genus of Blattoid, and of unusual size. The surface is densely chitinous, and crossed by a series of powerful well-branched veins, the cubitus being especially well developed, and much unlike any other known among the Coal-Measure Blattoids. The general characters of the wing seem to show that the insect occupied an intermediate position between the families Archimylacridæ and Hemimylacridæ.

June 20th, 1923.—Prof. A. C. Seward, Sc.D., F.R.S., President, in the Chair.

The following communication was read:—

'The River-Gravels of the Oxford District.' By Kenneth Stuart Sandford, B.A., F.G.S.; with an Appendix on the Non-Marine Mollusca, by Alfred Santer Kennard, F.G.S., and Bernard Barham Woodward, F.L.S., F.G.S.; and an Appendix on the Mineral Analyses of the Clay- and Sand-Deposits of Wolvercote, by R. C. Spiller, B.A.

The Author shows that ancient river-terraces occur in the headwater region of the Thames basin, west of the Chilterns, and that they maintain the same curve as the thalweg of the present rivers with which they are associated.

There is no discontinuity of the terraces of the headwater tributaries of the Thames at their confluences near Oxford.

Three terraces are identified above the present flood-plain, and to each, in order to avoid confusion, a place-name is given:—

Handborough Terrace	about 100 feet above river-level.
Wolvercote Terrace Wolvercote Channel }	about 40 feet above river-level.
Summertown-Radley Terrace	about 20 feet above river-level.

Below the last are flood-plain gravels, and a sunk channel has been identified.

The Handborough Terrace is in immediate contact with, and younger than, a plateau-drift which the Author considers to be of glacial origin.

Each of the three terraces contains a warm-climate fauna with *Elephas antiquus*; but there is evidence of colder conditions in the upper part of the Wolvercote Channel, and in the base of the succeeding terrace.

The Proboscidea are represented by a suite of forms, from *Elephas antiquus* of archaic characters to the Siberian mammoth.

The warm-climate fauna lingers long in the area, and is strongly marked by abundant remains of *Hippopotamus* and *Corbicula fluminalis* in gravels which rest upon deposits containing *Elephas primigenius* and *Rhinoceros tichorhinus*, both gravels being of post- or very late Acheulean age (Summertown-Radley Terrace). The full suite of 'Northern forms' is not found in the district.

Palæolithic implements are scarce, and unabraded specimens are confined as yet to the Wolvercote Channel: these are of Acheulean culture.

MISCELLANEOUS.

On the Skull and Mandible of a Siberian Mammoth: a Correction.

In the last number of the 'Annals' an unfortunate mistake has occurred in the legend to the Plate accompanying Dr. C. W. Andrews's paper (Plate X.). It should read $\frac{1}{14}$ instead of $\frac{1}{4}$ nat. size. It is given correctly in the Explanation of the Plate.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 71. NOVEMBER 1923.

LVII.—*Mediterranean and other* Cribrilinidæ, *together with their Relationship to Cretaceous Forms.*

By Arthur Wm. Waters, F.L.S., F.G.S.

[Plates XVII. & XVIII.]

When references are used more than once the following contractions are employed :—

1886. Jullien, "Les Costulidées," Bull. Soc. Zool. de France, vol. xi. (Costulidées).
1902. Harmer, "Morph. of the Cheil.," Quart. Journ. Micro. Sc. n. s. vol. xlvi. (Morph.).
1921, 1922. Lang, Cat. of Cretac. Crib. Bry. (vol. iii.) or (vol. iv.).
1909. Levinsen, "Morpholog. & Systematic Studies of the Cheil. Bry." (Studies).
1903. Norman, "Nat. Hist. of E. Finmark," Ann. & Mag. Nat. Hist. ser. 7, vol. xii. (Finmark).
1874. Reuss, "Foss. Bry. Oest.-Ung. Mioc.," Denk. Math.-Naturw. k. Ak. Wien, vol. xxxiii. (Oest.-Ung.).
1879. Waters, "Bry. of the Bay of Naples," Ann. & Mag. Nat. Hist. ser. 5, vol. iii. (Naples).
1887–9. Waters, "Bry. from N.S. Wales, N. Australia, etc.," Ann. & Mag. Nat. Hist. ser. 5, vol. xx. p. 93, and ser. 6, vol. iv. (N.S. Wales, vol. xx.) or (vol. iv.).
1909–10. Waters, "Mar. Biol. of the Sudanese Red Sea," Journ. Linn. Soc., Zool. vol. xxxi. (Red Sea).
1913. Waters, "Bry. Brit. E. Africa & Zanzibar," Proc. Zool. Soc. (Zanzibar).
1918. Waters, "Mar. Bry. of Cape Verde Isl.," Journ. Linn. Soc., Zool. vol. xxxiv. (Cape Verde).

Puellina radiata (Moll.), p. 556.
—— *innominata* (Couch), p. 556.
——, var. *vicariata*, nov., p. 559.
——, var. *hincksii*, Friedl, p. 560.
Cribrilina balzaci (Aud.), p. 561.
—— *punctata* (Hassall), p. 563.
—— *nitido-punctata* (Sm.), p. 564.
Figulina figularis (Johnst.), p. 567.
—— *carinata*, sp. n., p. 569.
—— *tahitiensis*, sp. n., p. 571.
—— *clithridiata*, Waters, p. 571.
Cribrilina latimarginata, Busk, p. 571.

Although at work upon some Mediterranean Cyclostomata, the appearance of Dr. Lang's two volumes of the 'British Museum Catalogue of Cretaceous Cribrimorph Bryozoa' made it advisable that I should re-investigate the Mediterranean Cribrilinidæ, for, on looking at the plates of the first volume, the impression was how similar the fossil characters are to what we know in recent Cribrilinidæ, and this was more than confirmed when the second volume was published; whereas Dr. Lang seems to have an entirely different impression. He considers that many fossils described under *Cribrilina* and *Membraniporella* and other recent genera are in no way closely related to them, and "the Cretaceous Cribrimorph forms in consequence needed at least a generic nomenclature of their own" *.

It therefore seemed that, before attempting to come to a definite conclusion, a fuller comparative knowledge of the recent forms was required, and a start was made with the Mediterranean fauna, at the same time comparing what I had available from other places and looking through the British Museum collections. As the Mediterranean has representatives of the main groups, known elsewhere, it becomes a fairly general study of the Cribrilinidæ. I have previously given the geographical distribution † of *Cribrilina* and again referred to the genus ‡. To most of the points raised in the latter paper I still adhere, though I was speaking of *Membraniporella* as described recent, and not of all the fossils under that name.

Before proceeding to consider my results, I must enter a protest against the difficulties that are put in the way of our studies. We have recently had several large works, with not only a large number of species and genera, but many new names of structures, and unless these names are really required they are much to be regretted, for every name that has been given always remains, whether it is the best or not, whether it is in use or not, and cannot be erased if ever used, for when we turn to Busk's, Smitt's, Hincks's, and other

* Lang, "Pelmatoporinæ," Phil. Trans. Roy. Soc. London, ser. B, vol. ccix. p. 191 (1919).

† "Franz-Josef Land," Linn. Soc. Journ., Z. vol. xxvii. p. 64 (1900).

‡ (Cape Verde), p. 10.

works we must know what their terms meant. My idea has always been that, if a recognised leader has introduced a term which has become established, it should be retained if the meaning is clear and it is not absolutely bad for any reason.

Dr. Lang, when giving extensive new terminology, says it is to aid clear reasoning. Many of such names are useful to the authors, but the other side of the question is, that unless the present tendency is kept in check, there will be no one but the authors to do any clear reasoning. One large work after another, in the author's own esperanto, follows so closely that we have not assimilated the terms in the first before we have to study an entirely new language in another voluminous work, probably with many good observations which we wish to master.

The first name given was *Cribrilina*, Gray, the character indicated by the name, being the rows of pores; next we have the Costulidæ (*Jullien*), the name being taken from the ribs, but in *Cribrilina* the ribs are a subsequent character to the pores; then we have Pelmatoporidæ, a name taken from the ornamentation of the ribs.

In *Cribrilina innominata*, etc., the costæ and pores either radiate from the median line or are horizontal in front, and these costæ are nodulated, certainly often so faintly that they have been overlooked, and when first examining the specimen (Pl. XVII. fig. 3) the costæ seemed plain, but upon looking with a higher power and bright sun-light the nodules were distinctly made out, an interesting point being that there are only half as many nodules (3) as pores (6). The zoœcia on the left of fig. 1 are drawn as first seen, that on the right shows these nodules. We find something of the same kind in *C. gattyæ*, B., *C. balzaci*, Aud., but more distinctly in *C. punctata*, Hass., in which I had previously been aware that there were nodulated costæ, and that these nodules often form spinous processes. These spinous processes are clearly seen in *C. tubulifera*, Hincks*, in a specimen in my collection from Ball's Head, and, again, still more pronounced in the small Australian fossil *C. suggerens*, Waters†. These are the *Acanthocella* of Canu and Bassler, and the Cribriline structure is well seen in their figure (pl. xliii. fig. 13).

We have thus found that the pelmæ, including pelmatidæ, can be traced from almost inconspicuous nodules on the

* "Gen. Hist. Mar. Poly.," Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 56, pl. i. fig. 7 (1881).

† "Foss. Cheil. Bry. from S.W. Victoria," Quart. Journ. Geol. Soc. vol. xxxvii. p. 327, pl. xvii. fig. 75 (1881).

costæ, and that Pelmatoporinæ are abundant recent; a little further examination shows that *Castanopora*, Lang, does not seem to differ generically at all from the most common of our European *Cribrilina*—in fact, it almost seems as if some of the Cretaceous forms might be considered varieties of our recent species, though rather larger; and for the zoologist, the genera *Castanopora*, L., and *Rhiniopora*, L.*, separated on slight grounds, are the most interesting (even if the names are dropped) as being represented in the living fauna. *Castanopora glandulosa*, L., *C. castanea*, L., *C. dibleyi*, Bry., look much like varieties of *Cribrilina radiata*, though at present it is sufficient to show the close relationship. While a large part of the *Castanoporæ* are related to recent *Cribrilina*, I do not follow why *Stichocades* is placed here.

Lang, when making this new generic classification, took one subfamily, the Pelmatoporinæ, and expanded his condensed account into a fuller statement †, saying other subfamilies would serve the same purpose nearly as well, and later he published the two volumes of the Cretaceous Cribrimorph Bryozoa, naming about 217 species, some of which were mentioned in preliminary papers. I have also now given most attention to the Pelmatoporinæ.

There can, of course, be no doubt that a large number of Cheilostomata show relationship with *Membranipora*, but in regarding the relationship of *Cribrilina* to *Membranipora* somewhat of the fairy tale seems to have crept in, and I cannot consider the two genera so closely allied as is sometimes supposed. Besides studying the relationship from below, we should make comparative study in some of the higher Cheilostomata, and from Mentone I have a most interesting specimen of what I formerly called *Lepralia pallasiana*, var. *projecta*, Waters ‡, but now *L. otto-mulleriana*, Moll., prepared in Eau de Javelle. At the growing ends there are some zoœcia, which have a thin calcareous wall; over this there is in places a growth, like irregular broad spines (see Pl. XVII. fig. 1), from the border of the zoœcia; later merging together to form a more or less complete frontal surface over the original calcareous wall, and the *Cribrilina*-like structure, as growth proceeds, is soon wholly obscured.

On these calcareous supergrowths there are a number of nodulations, often forming rows and seeming comparable

* Vol. iv. pp. 202, 180.

† "Pelmatoporinæ," *loc. cit.*

‡ (Naples), p. 42, pl. x. figs. 3, 3*a*. Also described by Barrosa as *Hippodiplosella spinosissima*, Barrosa, "Notas sobre Briozoos Españoles," Bol. Real. Soc. Hist. Nat. vol. xx. p. 7, figs. 1–18 (1920).

with the pelmæ on the bars of Cribrilinidæ. Later on they are much raised, forming the spinous processes to which I referred in my original description. Although I have prepared the growing ends of many specimens of *L. otto-mulleriana* without again finding the structure as distinct, many show the frontal wall in successive stages—at first there is only a slight growth near the proximal end, at a later stage the wall is completed except near the oral aperture (Pl. XVII. fig. 5). In some cases the calcareous wall is nearly smooth, as in fig. 1, in others large so-called pores are formed, and round these the wall grows, as may be distinctly seen at the edge of the wall (Pl. XVII. fig. 5); moreover, the calcareous wall is often thickened round these pores. Next, in some cases, irregular ridges are formed, often enclosing an area in which there is a pore (Pl. XVII. fig. 6, lower part). The ridges may radiate to the median line or may cross over the zoœcium. Besides these large pores are also small areolar pores close to the border, formed first towards the distal end. It is usual to continue to speak of these openings as pores, although we all know that there is no opening to the interior, as there is a membrane. The calcareous ridges may become very solid and ultimately merge, becoming quite indistinguishable through an irregular surface being formed with stout spinous processes when the pores may not be distinguishable (Pl. XVII. fig. 2).

The knobs or protuberances on *Schizoporella auriculata*, Hass., are formed in a somewhat similar manner. The growing lateral walls seem to have slight denticles, but this is only the spaces being left where the areolæ are formed. *Umbonula verrucosa*, Esper, from the Laminarian zone in Mentone, has very solid calcareous walls, whereas Hincks speaks of this only being the case in the deep-sea forms. Here, again, we find nodulated ridges on a calcareous wall much as in *Lepralia otto-mulleriana*.

Schizoporella triangula, Hincks, shows, at the growing edges, zoœcia with very faint ridges radiating from the umbo, with rows between each two ridges; afterwards, nodules and protuberances are developed all over the zoœcia. In the earlier stages of *Smittia inæqualis*, Waters, the frontal surface is quite smooth, without any pores except the areolar ones; later, the irregular projections grow, and the front wall, in forming, gradually closes in up to the oral aperture. This we can also see in *Schizoporella linearis*, var. *hastata*, Hincks, *S. sanguinea*, Norm., and other cases. The growing ends and primaries are the most fragile parts of the zoœcia, so that they will not be met with very frequently fossil,

and for recent forms careful collecting and preparation is requisite. *Decurtaria cornuta*, Lang (pl. viii. fig. 9, not the text-fig.), looks like a variety of *Lepralia poissonii* now living in New Zealand.

The predominant idea in Lang's Catalogue is that Cribrilinidæ came to an end by an over-deposit of calcareous matter, or as he says, "became buried under the products of its own activities," and "lineages which secrete calcium carbonate are, therefore, doomed lineages." If this is the case, we might expect to find some evidence of this in recent forms—I am not aware of any,—so am waiting to see if support is forthcoming elsewhere, but would ask whether the changes which took place in the Cretaceous Cribrilinidæ may not have been caused by changes of temperature, depth of sea, etc." (Lang, vol. iii. p. xxv).

According to Lang, there seems to be a large number of ups and downs regarding the calcareous deposit, so that when it increases, as expected, this is taken as a natural occurrence or ascending evolution, but when there is a decrease it is called "catagenesis"* or declining evolution. This makes it difficult to follow the line of changes, and the decision seems arbitrary. It is also said that similar evolution is repeated again and again in independent lineages. Does not this also look like changes caused by different temperature, different currents, or water contents, and we may ask what confirmation is given to the theory in other groups of Cretaceous Bryozoa and other fossils—at any rate, as this is not what we should expect, great hesitation may be allowed until more extended studies have been carried out.

Diagrams lead us naturally to expect more regularity than we find in the plates, and in recent Cribrilinidæ we certainly see great variations in a colony in various points, especially as to whether there are avicularia.

New species are made according to whether a species is encrusting, erect, uni- or bilaminate, but if it had been known how frequently in the Cretaceous formation zoœcial similarity occurs, with zoarial differences, it would have given the strongest support to those who last century were urging the great importance of zoœcial characters, and I should strike out any species merely separated as incrusting or erect. In recent forms we are frequently seeing this—for example, *Schizoporella unicornis*, Johnst., also *S. sanguinea*, Norm., are at first encrusting, then they may start an erect

* Vol. iii. p. xxxiii.

growth which may be unilaminate, bilaminate, or multilaminate and massive. If pieces of these were discovered fossil, at least four species might be made, perhaps as many genera. Many such cases are before a zoologist, but the paleontologist has not always sufficient material to check his conclusions. *Cribrilina innominata* occurs bilaminate, as *C. innominata*, var. *foliata*, Norman.

It is, however, evident Dr. Lang had some well-preserved material, enabling him to add somewhat to our knowledge of the Cretaceous Cribrilinidæ, though in some genera, as, for example, *Castanopora* and *Rhiniopora*, it would seem there has frequently been but one small and perhaps imperfectly preserved specimen on which to found a species.

Size.

Very special stress seems to be laid on size, for this is usually repeated in the diagnosis and description, and in one case the diagnosis gives nothing but the size, which is repeated in the description with additional details. In recent forms size seems to have value in helping to discriminate in a limited area, and sometimes size may be identical in very distinct localities, but with altered conditions, such as depth and temperature, we may be prepared for great variation, besides which there is great difference in various parts of the colony.

Avicularia.

The avicularia are given an important place and, like the the other characters, must be carefully studied, but we may well remember that in recent Cheilostomatous forms there are not only genera, but species, which sometimes have avicularia, sometimes none (for instance, *Figulina figularis*, Johnst., *Cribrilina punctata*, Hass., etc., etc.), and we may well keep in mind the various avicularia in *Smittia nitida*, Verrill, *Adeonella*, etc. Sometimes, when Lang speaks of dimorphic avicularia, there seems no difference except size.

In the Cretaceous Cribrilinidæ no large avicularia with wide spatulate mandibles have been mentioned. They are very characteristically vicarious*, taking the place of a zoœcium and connected with each of the neighbouring zoœcia, on which account I at one time called them zoœcial avicularia; now, Canu and Bassler call them "interzoœcial

* Busk, 'Challenger' Exp., Zool., Cheilostomata, vol. x. p. xviii (1884).

avicularia"*, which must comprise avicularia of various shapes, including narrow acute ones, such as *Schizoporella viridis*, Thornely †. In the Tertiary of N. America *Puellina radiata anatica*, Canu and Bassler, has avicularia of this type, though narrow. However, it is often difficult to always distinguish which are vicarious, for while in such cases as *Schizoporella auriculata*, Hass., *S. linearis*, Hass., *Smittia nitida*, V., where the avicularium rises out of the front, it clearly belongs to one zoœcium, though in other cases it is not as obvious, these last are called frontal by Canu, and are the adventitious avicularia of Busk, who also uses the term for those interspersed among the zoœcia. Lang divides into sporadic and definitely orientated avicularia. There are small spatulate avicularia in *Tricephalopora ansata*, Lang, but from the plate I should judge that they do not belong to the zoœcia but are between zoœcia.

In most of Lang's text-figures it looks as though the avicularium was supposed to grow out of the extra-terminal front wall, whereas, judging from the plates, they seem generally between two or more zoœcia, as may be seen in *Castanopora*, L., *Cælopora*, L., *Pliophlœa*, *Otophora auriculata*, L., etc.; also in *Cribrilina radiata*, Moll., *C. innominata*, there seems to be always a connection with two or more zoœcia. As an instance, in the text-fig. of *Baptopora immersa*, Lang (vol. iv. fig. 6), the avicularium is shown as coming out of the side, but from pl. i. fig. 1 I should describe it as placed distally, above the oral aperture, a frequent position in some Cribrilinæ and in *Membranipora*—for example, in *M. flustroides*.

In *C. innominata* there are often vicarious avicularia between the zoœcia. Now these must usually be near an oral aperture, on one side or the other, without having anything to do with an oral aperture, in the sense, in which a frontal avicularium may belong to the aperture, and they do not seem to be definitely orientated, though one or two cases are found where there is an avicularium at each side of the oral aperture without being a pair.

When considering the diversity in such a character as avicularia, do we sufficiently keep in mind how much intercrossing there may be when spermatozoa of so many species are floating about?

Judging from recent forms it would seem natural to say

* Levinsen calls the vicarious avicularia "independent," and the frontal ones "dependent."

† *Schizoporella viridis*, Thornely, see Waters (Red Sea), pl. xiii. fig. 1, has vicarious avicularia with a large acute mandible, and the zoœcia have frontal avicularia with similar but smaller avicularia.

that avicularian characters have been used for the fossil genera where they have not more than specific value, even if that, and in recent species there is very great variation. Of course, we must not take it for granted that these characters have followed exactly the same lines as far back as the Cretaceous times; nevertheless, as we find the Recent and Cretaceous forms so closely allied, we must use the values established in recent forms. All characters should be mentioned without pinning our faith to the least constant. The shape of the frontal opening of the avicularium often furnishes characters of importance, but these will not often be sufficiently preserved in fossils.

Fusions.

I may be wrong, but the term seems to indicate that the costæ are supposed to be first completed, and then the cross-connection is made, whereas the calcareous wall is formed round the pore, when there is one, or the spot where the pore will be, and then the costæ are gradually thickened (Pl. XVII. fig. 5, Pl. XVIII. fig. 12). In a large number of fossils it will be impossible to be certain if there are pores in the furrows, or, as Lang would say, if there are fusions, and I have just found that my specimen of *Kelestoma elongatum*, Marsson=*gradatum*, Lang, a species described by Lang as without lateral fusions, shows in the best-preserved parts furrows with about four pores (Pl. XVIII. fig. 13) (p. 565).

In about the first 67 species of Pelmatoporidæ "no fusions" are indicated, but now, after this discovery, it is open to doubt whether better-preserved specimens will not reveal rows of pores in a large number of cases. Certainly these frontal rows of pores are a character to be always recorded, but we must again urge caution, any one character alone will not carry us far.

Costæ.

The number of costæ is also given as an important character, and, of course, is one which must be taken into account, but we see such a range in our common *C. radiata* and *C. innominata* that this must be kept in mind; further, there may be more or fewer costæ in an abnormal longer or shorter zoœcium than in an ordinary one.

Spines.

The number of spines is given, and they seem to have a certain though limited value in the Cribrilinidæ, for in

C. gattyæ and *C. innominata* there are usually three or five; in *C. punctata* four seems to be the rule; in *C. balzaci*, the two proximal spines are the stoutest, the distal ones are variable and smaller; in *C. gattyæ* and *C. radiata* the distal spines are the longest. Most species have usually throughout an even or an uneven number, three or five, four or six, subject to occasional abnormalities—Lang's species have usually four or six.

With regard to the spines there are cases in Cheilostomata where, with oral spines at the growing ends, none are visible in the older parts: for instance, in *Schizoporella auriculata* there are three spines at the growing end and in *S. linearis*, var. *hastata*, two spines, but in neither case are any seen to the mature zoœcia. On the other hand, *Lepralia ottomulleriana*, Moll., has four at the growing end (the two more distal ones not being formed), in the older zoœcia there are six, or very occasionally eight, so that there seems considerable irregularity as to whether the younger or older zoœcia have most spines. Fossils, where probably only a few mature specimens are known, may be described as without, though other parts may have spines.

Ovicells.

Ovicells are almost ignored, and when figured are seldom described, also very little attention is given to the oral aperture, or to pore-chambers, which will not very often be visible in fossils.

Secondary Aperture.

I do not feel competent to form a definite opinion on Lang's secondary aperture from the plates, without an examination of a series of specimens. By the primary aperture was meant the opening closed by the operculum, and beyond this there is often a complete or partial peristomial tube, the end of which was sometimes mistaken for the opercular aperture.

In such cases as *Tricephalopora tripartita*, Lang *, and *T. sherborni*, Lang †, is there a large calcareous plate proximal to the primary opening? If an arch is formed over the primary aperture it does not follow that this arch forms any part of a secondary aperture, see *Phyrmatopora bufo*, Lang

* Vol. iv. p. 81.

† Vol. iv. p. 84. *Tricephalopora cerebus*, L., *T. obducta*, L., *T. obtecta*, L., seem, from Lang's plates, to be the *Cephyrotes saillans*, Canu and Bassler.

(vol. iv. p. 200). Such an arch is in many Cheilostomata frequently formed by the meeting of two lateral avicularia.

The "bar" is the thickened part proximal to the oral aperture, and it sometimes furnishes useful characters ; it has been called the mucro, and in *Arachnopusia* there is below the oral aperture a hollow bar having an avicularium in the middle, sometimes two.

Cribrilina should be further studied, starting without a theory, but comparing Living, Tertiary, and Cretaceous forms. At the same time, similarity of some characters in the Catenicellidæ * may be investigated, perhaps throwing light on both groups. Many have a distinct area very similar to that of the Cribrilinidæ, but in others there are only the "fenestræ," as in *Catenicella wilsoni*, MacG., *C. intermedia*, MacG., *C. ventricosa*, Busk, and in many there is also a suboral pore. In *C. geminata* and *C. alata*, var. *gemella*, MacG., there are but very minute pores round the border. The above, however, do not show the Cribriline characters as clearly as *C. benecostata*, Levinsen †, which has fenestræ and also a slit between the rays.

Realising that there are marked Cribriline characters, we may go further and enquire whether the chambers round the border of *Catenicella* are to be compared with the avicularia bearing interzoœcial secondary tissue in *Racheopora*, Lang, and *Prosothopora*, Lang ‡.

I have described some long forms of fossil Catenicellidæ, *C. septentrionalis*, W., and *C. continua*, Waters §, from the Italian, and *Ditaxipora internodia*, Waters ‖, from the Australian Tertiaries, and most probably the short forms with one, two, or three zoœcia are derived from longer zoaria.

In the Mediterranean we have the :

(1) *Puellina gattyæ* group, including *P. innominata* and *P. radiata*.

(2) The *Cribrilina punctata* group ¶, including *C. balzaci*.

(3) The *Figulina figularis* group, which has allies in the Southern Hemisphere, throwing light upon the value of certain characters. All these groups are represented in the Cretaceous.

* See Harmer (Morph.), p. 334, and Smitt, Öf. k. Vet.-Ak. Förh. vol. xxiv., Bihang, p. 46 (1867).

† (Studies), p. 237, pl. xii. figs. 1, *a*, *b*.

‡ (Vol. iii.), pl. viii. figs. 1–6.

§ Quart. Journ. Geol. Soc. vol. xlvii. pp. 5, 6, pl. i. figs. 1–8 (1891).

‖ Quart. Journ. Geol. Soc. vol. xxxvii. p. 318, figs. 78, 79 (1881).

¶ Closely related to *Pelmatopora corylii*, Lang, and other *Pelmatoporæ*.

Puellina innominata (Couch). (Pl. XVIII. figs. 9–12.)

Puellina is described by Jullien as without pores in the furrows; but this is not the case, for there are a few to each furrow. However, as *punctata* must be the type of *Cribrilina*, it is convenient to retain *Puellina*, though not yet satisfactorily described.

There has been much effort to separate what has been known as *C. radiata* from *C. innominata*, and this seemed hopeless, even although Smitt* had placed those with a suboral pore under *innominata*, and those without under *radiata*. This was not then convincing, and the two are hopelessly mixed by Busk, Hincks, and Norman in their collections in the Natural History Museum. Then, I recently came to the conclusion that *radiata* could be separated from *innominata* by the primaries, as I had found a few closed primaries on forms without a suboral pore; further investigation showed that many specimens, considered as without the pore, had it in a few zoœcia. When the pore is well marked there is a protection behind it, either formed by the triangular enclosure or a process, even in some Naples specimens two processes, which may partly coalesce, almost surrounding the pore (Pl. XVIII. fig. 10). Where there is a row of small pores below the oral aperture this protection is absent, even if one of the pores is larger.

The consideration of the primaries and my observations of *Microporella malusii* with some closed primaries (see p. 558) caused me to hesitate in making a definite division, as a sharp dividing-line could not be found.

These facts should be kept before us, and studied when ample good material is available; at present, although there is uncertainty, I speak of forms with a large suboral pore as *innominata*.

The primary has 11 spines, a large one at the proximal border bifurcates. (This primary has been described as *C. radiata* by Harmer), and the primary of *C. gattyæ* is very similar, having the same number of spines, but the proximal scutum-like spine does not bifurcate, nor are there the "lobes" on the other spines. Harmer refers to the line of "membranous papillæ" in series with the "vibraculoid setæ." These all seem to be simply spines, the first of which is very narrow with a very acute point, whereas those round the border are short and obtuse. Harmer thinks

* 'Floridan Bryozoa,' p. 22 (1873).

that the oral spines together with the membranous papillæ correspond with the marginal spines of the ancestrula : this does not at first look impossible, but the difficulty meets us that so many workers have maintained that the costæ are the analogues of the marginal spines of *Membranipora*. Now we cannot consider that both the costæ and also these spines are inherited from *Membranipora*. The number of the blunt surrounding spines varies very much, so that zoœcia close together may have 8, 9, 11 blunt spines besides the two "vibraculoid setæ" and the four oral spines, in all 14, 15, 17, while the primary has always 11. In decalcified preparations I have always found the "vibraculoid setæ" and the short blunt spines are empty sheaths.

The pores are in the same radii as the "membranous marginal spines," whereas the costæ are between these radii. With Harmer's description of the costæ both Norman and Levinsen disagree, but, as after repeated readings of what Harmer says, I am not sure what he considered was the

Cribrilina innominata decalcified, showing spines round the area.

structure of the costæ, so do not know how far I agree. Did he mean that the costæ are formed by the coalescence of two spines? The costæ of certainly most Cribrilinidæ are hollow, as is also the bar or mucro below the oral aperture, and this will account for the thin line of air seen by Harmer. Now the costæ commence in the wall beyond the area (on the extra-terminal wall of Lang) ; after the area is formed then the position of the pores is first fixed on the membrane, and the calcareous deposits take place round the pore. If the area is broken down, a row of hollow ends of the costæ is seen ; and in such cases as *innominata* there are on the costæ simple nodules formed gradually, but in more advanced forms such as *punctata* and its ally *nitido-punctata*, the hollow of the costæ (namely, the lumen) is connected with the tubular projections, called pelmæ by Lang.

Norman's figures are not satisfactory, but, without knowing

it, he has shown how the calcareous wall is formed by a thicker deposit round the pores (see his pl. ix. figs. 4, 6), the pore on the middle of the left-hand side of fig. 4 shows the thickened wall beginning to surround the pore.

To return, in some Cheilostomata the primaries may be with or without a calcareous cover—for instance, *Microporella malusii*, of which I have had hundreds under examination, usually has a primary with a border having ten spines and a membranous front wall; but a few specimens from Mentone have a marginal border with ten spines, and within this a calcareous front wall similar to that of the mature zoœcia with only a few surface-pores, perhaps one in fifty is thus closed. Neviani* considered that he had found three forms of primary of *M. malusii*, but I am unable to understand his fig. 4 representing a primary, and have little doubt that fig. 5 is the primary of *Haplopoma impressa*, Aud. Unfortunately, his plates in my copy are badly printed. Levinsen's figure† of the primary of *Microporella ciliata* should be compared.

Castanopora, Lang, includes all the recent forms of the *innominata* group, and some of his species are so closely allied that they might almost be considered as varieties of the recent forms of *radiata* and *innominata*, and most have more costæ than are known in the recent forms, but others have about the same number. The zoœcia of *Puellina gattyæ* are about 0·24 mm. long; *P. radiata*, 0·25–0·33 mm.; *P. innominata*, 0·28, 0·36, 0·45 mm.; *Cribrilina balzaci*, 0·5 mm.; *C. punctata*, 0·36–0·38 mm.; whereas the Cretaceous fossil *Castanopora* vary from 0·8–·2 mm.

Castanopora castanea, Lang, in pl. v. fig. 2 resembles the recent *Puellina innominata*, of which I have specimens with the proximal part spreading out, as shown by Lang in the lower zoœcium of pl. v. fig. 2, and *C. glandulosa*, L., and *C. juglans*, L., also remind us of *P. innominata*. *P. innominata*, C., usually has a number of not much raised costæ, the avicularia are often narrower than those of *P. radiata*, and are frequently placed longitudinally.

Inside the oral aperture of some Naples specimens a plate may be seen extending inwards (Pl. XVIII. fig. 10). The development of this is curious, for, before the frontal and aperture region is fully formed, the plate is seen to extend across the opening (Pl. XVIII. figs. 9, 11). The upper edge

* "Appunti sui Bri. del Medit.," Bull. Soc. Ital. Rom. (St. Zool.) vol. vii. p. (4) 166, figs. 2–5 (1898).

† (Studies), pl. xv. fig. 5.

will ultimately form the proximal border of the oral aperture (Pl. XVIII. fig. 10).

Loc. Common in the Mediterranean and British Coast, Atlantic, New South Wales.

Puellina innominata, var. *vicariata*, nov. (Pl. XVII. fig. 3.)

This was sent to me by Miss Jelly, marked "*Cribrilina radiata*" from Singapore or Philippines. It has blind zoœcia, some nearly as large as ordinary zoœcia. The avicularium is vicarious and has a very long mandible—really, the distinguishing character.

This specimen has been alluded to as being what d'Orbigny * called *Distanescharella*, an unnecessary genus, as small closed zoœcia resembling the perfect zoœcia turn up in various genera not closely allied. These cannot be considered as a specific character, but as a condition. The ordinary zoœcia are usually very close together, though distant where the closed zoœcia occur (as in Pl. XVII. fig. 3). The costæ of the mature zoœcia seemed at first even and plain (*a*) until one day I got direct sun-light on it, when with a higher power the costæ were seen to be nodulated (*b*), usually three nodules on each costa, whereas there are generally six pores. The nodules are general in *C. innominata*; and in other species when more fully developed form strong spinous processes.

The characters of the zoœcia are more or less repeated in the blind zoœcia referred to, which Levinsen would perhaps call heterozoœcia, but for the present we may speak of plain or ornamental kenozoœcia.

There are also blind zoœcia, resembling in ornamentation the larger zoœcia of the species, in *Cribrilina patagonica*, Waters; *C. tubulifera*, Hincks; *C. nitido-punctata*, Sm.; *C. figularis*, John.; *C. clithridiata*, Waters; and, I think, in many other cases. Duvergier has described *Distanescharella castasensis* †, which has the character mentioned by d'Orbigny. Lang describes the same structure in presumably *Castanopora dibleyi*, Brydone ‡. Canu has made a genus *Pleuroschizella* § for forms somewhat resembling *Distanescharella*, and says the zoœciules are larger than those of *Trypostega*, Lev. It does not seem that the *Distanescharella* of Lang, or of

* Pal. Fr. vol. v. p. 451.

† Duvergier, "Bry. du Néog. de l'Aquitaine," Soc. Linn. de Bordeaux, vol. lxxii. p. 25, pl. i. fig. 11 (1921).

‡ Vol. iv.

§ "Bry. de la Région de Corbières," Bull. Soc. Géol. de France, s. 4, vol. xviii. p. 303 (1918).

Canu and Bassler, is what d'Orbigny described. There seem to be throughout the Cheilostomata many cases of accessory cellules, without the ornamentation of the mature zoœcia, and these plain kenozoœcia occur, for example, in *Distanescharella jacksonica*, Canu and Bassler (pl. xlii. fig. 1), and *C. euglypha*, Novak*.

Puellina innominata, var. *hincksii*, Friedl.

Cribrilina radiata, var., Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 74, pl. x. fig. 1 (1880), and ser. 6, vol. viii. p. 87 (1891).
Cribrilina radiata, var. *hincksii*, Friedl, "Bry. der Adria," Zool. Anzieger, vol. xlix. no. 9, pp. 225 & 268 (1917). Friedl gives wrong reference to Hincks.

This, of course, is the *Castanopora* of Lang, and really is most closely allied to *Castanopora glandulosa*, Lang, although there are only about 18 rays, whereas *glandulosa* has about 25, *castanea*, L., about 20, *C. dibleyi*, Bry., about 18. There is usually only one long avicularium in the recent form, but this is evidently sometimes the case in the fossils. The Madeira specimen has a suboral pore, with a ridge behind it, and this in a fossil may easily give the appearance of a bar, as figured by Lang†. A *C. radiata* from Capri shows a thickening of the lower lip just as figured by Lang in *Castanopora juglans*, Lang. *Cribrilina gilbertensis*, Maplestone‡, has a long and narrow avicularium at each side of the oral aperture as in *Castanopora*. This species is probably *C. innominata*.

The specimens from Madeira show interesting patches of growth, for in a few cases there are a few zoœcia growing on the front above the main layer, and in a specimen in the Musée Océanographique, Monaco, from between Fayal and Pico, 130 met., I found similar groups of super-cells. This kind of growth occurs in many Cheilostomata, and in *Schizoporella auriculata*, Hass., we may see groups of zoœcia in various parts growing on the first layer, or there may be a large patch growing more or less from a line. A most important point is that the direction of this super-layer does not follow that of the under-layer, for it may be across it, or often in an exactly opposite direction. This growth furnishes most valuable growing edges, often better protected than the main ones.

* "Kennt. der Bry. der böhm. Kreide," Denk. Math.-naturw. k. Ak. Wissen. Wien, vol. xxxvii. p. 92, pl. i. figs. 10, 11 (1877).
† (Vol. iv.) figs. 2, 3, pl. iv. fig. 1.
‡ "Polyzoa from the Gilbert Islands," Proc. Roy. Soc. Vict. n. s. vol. xxi. p. 411, pl. xxvi. fig. 6 (1908).

I have previously shown* that the multilaminate layers in various Cheilostomata grow in definite ways characteristic of different species; further, in this Madeira specimen (Pl. XVIII. fig. 6) these super-zoœcia have a wider and shorter avicularium, showing how readily the shape may be changed. An attempt has been made to find out from which part of the old zoœcium this new growth takes place, and it seems to start from near the oral aperture, though further investigation is required both in dry and spirit preparations. There is no reason to suppose that any of these super-growths are caused by larvæ settling on the front, and it is a growth from living zoœcia.

Loc. Madeira, N. Atlantic, Capri, Mentone, St. Raphael, British and French coasts.

Cribrilina balzaci (Audouin). (Pl. XVIII. fig. 8.)

Flustra balzaci, Aud., Savigny, Descr. de l'Égypte, pl. ix. fig. 8.
Cribrilina balzaci, Waters, "Bry. from Madeira," Journ. R. Micr. Soc. 1899, p. 9, pl. iii. figs. 31, 32; Norman (Finmark), p. 98, pl. ix. fig. 6.
Lepralia cribrosa (Heller), Waters, (Naples), p. 36, pl. ix. fig. 4.
Collarina cribrosa, Jullien (Costulidées), p. 7.
Cribrilina punctata, var., Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 266, pl. ix. fig. 9 (1886).
Puellina gattyæ, var. *balearica*, Barrosa, "Notas sobre briozoos Españoles," Boll. R. Soc. Hist. Nat. Espan. vol. xix. p. 340, figs. 1–5 (1919).

This may or may not be *C. cribrosa*, Heller. It has many points in common with *P. gattyæ*, B., both having 3–5 spines, but is distinguished by the much raised process or bar below the oral aperture, and has usually a short triangular avicularium, on one or both sides, a little lower than the oral aperture, though in a specimen from St. Raphael there are no avicularia; also *P. gattyæ* has one of the lateral spinous processes much prolonged on each side, and, further, *gattyæ* has 11 spines to the primary zoœcium with one stout central spine not bifurcate as in *innominata*, whereas the primary of *balzaci* is approximately the same as the ordinary zoœcia, also *C. balzaci* is materially larger than *C. gattyæ*.

A point not mentioned when discussing the primaries of the Cribrilinidæ is that the distal end of the primary of *balzaci* has pore-chambers, whereas on the proximal end

* (Red Sea), p. 144; (Zanzibar), p. 504; (Cape Verde), p. 15, pl. ii. figs. 17–20.

the thin wall is attached directly to the supporting material. This is interesting, and there are other similar cases, but there is nothing to cause surprise, as from the distal end of the primaries two or three zoœcia grow ; but it is not universally the rule that there are only distal pore-chambers, for in *Chorizopora brongniartii*, Aud., the zoœcia spread out in a fan-like manner, ultimately forming a circular colony, and about the third zoœcium, in series coming into contact with the proximal end of the primary, attachment is made by a pore-chamber to the proximal wall of the primary.

C. balzaci * has many points of resemblance with *C. punctata*, Hass., especially in the very pronounced process or bar below the oral aperture, but, instead of the small cribriform area of *balzaci*, the cribriform area of *punctata* extends practically over the whole of the frontal wall. *C. punctata* has four oral spines, and Hincks, when describing *balzaci* as *punctata*, var.†, realised the similarity of the two, and thought that specimens sent to him as *C. cribrosa* were *C. punctata*, but in this he was no doubt misled, not being acquainted with the points of difference now known.

Jullien in his definition of *Collarina* says without spines, but I showed them in my figure.

C. punctata, var., Hincks, Adriatic, Brit. Mus. Coll. 99.5.1.437, will be *C. balzaci*, and in *C. punctata*, Hincks, coll. 99.5.1.717, some are *balzaci*, some *punctata*.

There are specimens from Madeira, which I took for *balzaci*, which must perhaps be considered a variety, the area is smaller, sometimes with a thickened border, as seen in Eau de Javelle specimens. It has a thick bar formed of a distal thickening supporting a slight central mucro. There are two stout spines by the proximal part of the oral aperture, and the others when visible are very minute; also in the specimens only two or three avicularia have been found, never a pair, whereas in *balzaci* there are most frequently a pair. This variety also occurs from Mentone.

At the growing edge of *C. balzaci* and *P. gattyæ* the ovicell may extend beyond the zoœcia, growing direct on the substratum, and may have pore-chambers.

Loc. Naples, Rapallo, Villefranche-s.-Mer, Adriatic, Mentone, St. Raphael, Madeira.

* (Cape Verde), p. 10.

† "Pol. of the Adriatic," Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 266, pl. ix. fig. 9 (1886).

Cribrilina punctata (Hassall). (Pl. XVIII. figs. 3, 7.)

Lepralia punctata, Hassall, Ann. & Mag. Nat. Hist. vol. viii. p. 368, pl. ix. fig. 7 (1841).

For synonyms, consult Miss Jelly's Catalogue.

Lepralia thiara, Seguenza, Form. Terz. p. 370, pl. xvii. fig. 57 (1879).

Cribrilina (*Arachnopusia*) *punctata*, Neviani, "Bri. neog. delle Calabrie," Pal. Ital. p. 174 (1900). I do not see the close relationship with *Arachnopusia*.

As already stated, this has a cribriform area, similar to that of *C. balzaci*, Aud., but extending over nearly the whole of the zoœcium, both have a very marked mucro below the oral aperture. The oral spines in *punctata* are usually 4, Busk says 4–6, whereas in *radiata*, *balzaci*, *gattyæ* there are usually 5, sometimes 3–5.

The Arctic form described by Smitt as *punctata*, called *Cribrilina cryptoœcium* by Norman, has the calcareous deposit more solid than in *C. punctata*, from the more temperate zones, and perhaps it would have been enough to make it a variety, as was done by Andersson.

The oral aperture of *C. punctata* is larger (0·12 mm.) than that of *C. balzaci* (0·1 mm.), which, again, is larger than that of *C. gattyæ* (0·07 mm.). There is a row of rather large pores near the edge of the zoœcium, and a second row nearer to the keel. At the peripheral edge of the rays (costæ) there is a spinous process, and sometimes a nodule or spinous process further in; also there may be one or two spinous processes on the mucro-bar. These spinous processes seem to be the homologues of the "papillæ" in other species. *C. balzaci* and *C. gattyæ*, Hincks (pl. xxiv. fig. 3), show nodules at the end of the rays instead of the spinous process.

The zoœcial keel is general, although it varies in development, so that zoœcia are found hardly showing it or having a central boss. Two specimens sent to me by Norman as var. show it distinctly, and from Plymouth and Capri it is general.

There are two pores in each furrow, in this respect agreeing with *gattyæ* and *balzaci*. The primary and early zoœcia of *C. punctata* from Plymouth (Pl. XVIII. fig. 3) show that though the primary, on the whole, has the characters of the mature zoœcia yet is not identical. It has only one row of pores round the inner border and is much smaller, as are also the other early zoœcia.

From Busk's collection in the British Museum a specimen from Madeira, 99.7.1.1344, marked *punctata*, is *balzaci*. In

Hincks's collection specimens from the Adriatic are also *balzaci*.

Loc. Arctic, British, French coast, Denmark, Mediterranean, Wood's Hole Region (North Atlantic), Madeira (Hincks).

Cribrilina nitido-punctata (Smitt). (Pl. XVIII. fig. 13.)

Escharipora figularis, forma *nitido-punctata*, Smitt, Krit. fört. öf. Skand. Hafs-Bry. 1867, pp. 4 & 49, pl. xxiv. figs. 2, 3.
Cribrilina nitido-punctata, Nordgaard, Syst. fört. i Norge Poly. pt. 1, p. 19, pl. ii. fig. 3 (1894, 5); West Norweg. p. 84, pl. i. fig. 7 (1903); Bry. Arct. Reg. p. 50 (1917); Levinsen (Studies), p. 159.
Gephyrotes nitido-punctata, Norman (Finmark), pp. 94 & 101, pl. viii. figs. 12, 13; Nordgaard, Hyd. & Biol. Invert. Norweg. Fiords, p. 165 (1905); Lang (vol. iv.), pp. 25–27, fig. 9.

I found in the Natural History Museum a very interesting specimen from the Busk collection, marked *Cribrilina figularis* "Cold Area." At first it was thought to be a new species, but further investigation places it under *C. nitido-punctata*, a species with which I was practically unacquainted, and which has not been sufficiently described and figured, as Smitt's figures were very small. It, however, has the interzoœcial tissue more developed than in the specimens collected by Norman and examined by Lang; the blind chambers are more abundant, the structure of the arch is similar, as well as the long avicularia and long avicularian chambers, at the end of which there is a small triangular or rather rounded mandible, more or less at right angles to the axis of the zoœcia, and closed by two muscles. In my figure the mandible is shown more facing forwards than is usual. Just distal to the oral aperture there is a flat area (*a*), difficult at first to understand, but it appeared that it might be the base of a forming ovicell, as is confirmed in specimens sent to me by Nordgaard from Trondhjem Fjord.

In Cheilostomata, especially in *Retepora* and *Schizotheca*, there is often in a number of zoœcia a hollow in this position, indicating the commencement of ovicells, even though there may be no completed ovicell in the specimen *. At the distal edge of this area there are two round kenozoœcia, and in a specimen of what I considered *Hiantopora monoceros* there are two small avicularia in this position. In several species of *Porella* and *Retepora* there are two pores near the proximal end of the zoœcia, those in *Porella saccata*, Busk †, may open into the long avicularian chamber.

* Waters (Zanzibar), p. 525, pl. lxxii. figs. 1–7.
† Bry. (Franz-Josef Land), p. 81, pl. x. figs. 14, 19.

There is only one ovicell in the specimen, and it is large and raised, but as there is a membrane over it the surface cannot be studied. In the specimens from Skarnsundet, Trondhjem Fjord, kindly sent to me by O. Nordgaard, there are many ovicells to which there is a lamina with a central groove entering into the aperture, as in *Retepora monilifera*, var. *umbonata*, MacG.*. They are fairly smooth, but in places there are irregular thinner places and there are no interzoœcial spaces, the zoœcia being close together. The avicularia are much shorter than in the specimen I figured.

The most important structure is the arch, the proximal hollow part rises from the distal end of the frontal surface of the zoœcium; but the hollow distal part of the arch is attached with wide buttresses to the avicularian chambers. The early growth of the costæ is hollow and there is a lumen to the mature costæ, so that this species seems to have been wisely prudent in its deposit of calcium carbonate. The right-hand lower zoœcium of the figure has had the arch broken away, and now has the same appearance as younger zoœcia before the arch is formed.

Specimens from Florvaagskjar in the Byfjord, Bergen, also sent to me by Nordgaard, are intermediate between that from the "Cold Area" and that from Skarnsundet; there is not much interzoœcial space, and but few kenozoœcia, both of which are so marked in the specimen drawn.

To me it looks as though the rising of the proximal edge of the oral aperture has carried the two costæ with it, increasing the distance between the two costal bars, and thus made the lateral openings. There is no true foramen or spiramen, though the figures of the posterior arch led Canu and Bassler to believe that there was a spiramen.

Kelestoma elongatum, Marsson †, has a fairly similar arch (Pl. XVIII. fig. 13) called "Kropf" by Marsson, though a specimen from Moen sent to me so named by Levinsen, and which, I believe, was determined by Marsson, shows that the main structure is not what Lang supposed, for instead of there being an open space between the costæ, the better-preserved zoœcia reveal furrows with pores between the costæ, about four in each furrow (Pl. XVIII. fig. 13), and this discovery increases previous doubts as to how far fossils can be relied upon to show this character. Marsson described the species as incrusting, or forming an *Eschara*-like stem,

* (Zanzibar), p. 525, pl. lxxii. fig. 7.

† "Bry. der weissen Schreibk. der Insel Rügen," Pal. Abhand. vol. iv. p. 99, pl. x. fig. 13 (1887).

and *K. gradatum*, Lang, and *K. scalare*, Lang, can both remain as *K. elongatum*, Marss. My specimen Lang would call *gradatum*.

An Italian Tertiary fossil, which I* called *Porina duplicata*, Rss., has a peristome which may sometimes be seen in young zoœcia to be formed by an arch from one side, and there is only an avicularium on one side; of this I have specimens incrusting, bilaminate, or cylindrical, and many similar cases could be quoted.

An arch similar to that of *Gephyrotes* occurs in several cases, and under *Gigantopora fenestrata*, Smitt, it is referred to in my Red Sea paper †. *Microporella personata*, Busk ‡, has a plain arch over the aperture of the ovicelligerous zoœcia, formed at each side and then meeting in the middle, looking in one specimen like a produced peristome; the arch is most clearly developed in a Japanese specimen. In *M. hyadesi*, Jullien, I figured and referred to a similar plain arch over the ovicelligerous zoœcia. *Membraniporella* (?) *subagassizi*, Canu and Bassler, and *Corbulipora collaris*, Canu and Bassler §, both seem to have an arch.

I have already referred to the flat area distal to the aperture in *C. nitido-punctata*, and with all these arched species there is much to suggest that the arch is a protection to the opening of the ovicell, and we may find that it is not a systematic character at all, but a condition occurring in forms not very closely related.

Lang considers *Kelestoma* and *Gephyrotes* very closely related, both being *Kelestomina*, but now we know (see p. 565) that the type of *Kelestoma* has between the costæ furrows with a row of small pores (Pl. XVIII. fig. 13), whereas *Gephyrotes* has the two large openings between the costæ. We do not yet know what value we are to put on the characters of the front wall, and possibly these two species may be placed far apart. *Gephyrotes* is so closely allied to *Cribilina punctata* that I have dropped the genus *Gephyrotes*.

Among the variations of *C. nitido-punctata* there may be considerable interzoœcial tissue, there may be three to six costæ on each side, exclusive of the bar from which the arch springs. The avicularian chambers at the side of the aperture may be very long or but moderate in size. Inter-

* Waters, "North Italian Bryozoa," Quart. Journ. Geol. Soc. vol. xlvii. p. 25, pl. iii. fig. 14 (1891).

† (Red Sea), p. 170, pl. xviii. figs. 17–19 (1909).

‡ Busk, B.M. Cat. Mar. Polyzoa, p. 74, pl. xc. figs. 2, 3, 4 (1854).

§ N. Amer. Tert. Bry. p. 289, pl. lxxxiv. figs. 8–13, and p. 308, pl. xliii. fig. 14 (1920).

zoœcial tissue with chambers is found in *Cribrilina latimarginata*, Busk, and in Calpidoporidæ, Lang *, and Andrioporidæ, Lang *.

Loc. Hammerfest, 40–60 fath. (*Sm.*), Bergen Fjord; Trondhjem Fjord; Mostenstrømmen (*Nord.*), Nordkyn, Finmark (*Nord.*), Brosmeskjaer Bjarkø, 55 met. (*Nord.*); Hjettefjord, West Greenland (*Norm.*); "Cold Area," Busk's coll. The "Cold Area," or Faroe Channel, is between the Faroe Islands and the Shetland Islands, Norm. Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. (1906).

Figulina figularis (Johnston).

Lepralia figularis, Johnston, Brit. Zooph. ed. 2, p. 314, pl. lvi. fig. 2 (1847).

Cribrilina figularis, Hincks, Brit. Mar. Poly. p. 196, pl. xxvi. figs. 5, 7 (1880); Calvet, "Résult. Sc. de la Campagne du 'Caudan,'" Ann. l'Univ. Lyon. p. 257 (1896); Bry. Corse, p. 15; Jullien & Calvet, Bry. de 'l'Hirondelle,' pp. 47 & 127 (1903).

Figularia figularis Jullien (Costulidéos), p. 8; "Testicule chez *Lepralia figularis*," Mem. Soc. Zool. de France, pp. 1–3, pl. x. figs. 1, 2 (1888).

Cribrilina figulina (sic), Norman (Finmark), p. 98, pl. ix. fig. 7.

? *Lepralia haueri*, Reuss (Oest.-Ung.), p. 170 (30), pl. i. fig. 3; Manzoni, Bri. Plioc. di Castrocaro, p. 30, pl. v. fig. 55 (1875). (The ovicell as figured differs somewhat.)

Cribrilina philomela, var. *adnata*, Busk, Chall. Exp. p. 132, pl. xxii. fig. 7 (1884).

For other synonyms, compare Miss Jelly's Catalogue, but I should not now include *C. philomela*, Busk, only the variety.

C. figularis, J., and *C. haueri*, Rss., were both published about the same time, 1847. In *C. haueri* the large lateral marks are not shown on the ovicell. There is in Reuss's figure a notch, which has been taken for a sinus, but this appearance is sometimes caused when the two sides first join together, also there is a median keel, whereas a keel is rare in recent *figularis*. At any rate, the differences are slight, but Jullien made *figularis*, Johnst., the type of the genus *Figularis* and made *Lepralia haueri*, Rss.†, one of the types of *Barroisina*, though it is difficult to see a close relationship between his two types, *C. elegantula*, Hag., and *C. haueri*, Rss.‡; *Barroisina* is not a satisfactory genus. I cannot follow Neviani in placing *C. elegantissima*, Seguenza, under *Figulina*. It is most probably *C. annulata*, var. *spitzbergensis*, and is the *C. floridana*, Sm.

* Vol. iii. p. 198 and p. 78.

† (Oest.-Ung.), p. 170, pl. i. figs. 1–3.

‡ (Costulidæ), pp. (5), 603.

F. figularis is widely distributed in the Mediterranean and along the French and English coasts, and may be taken as the centre of a group including *F. speciosa*, Hincks, *F. carinata*, Waters, *F. clithridiata*, Waters, and its ally, *F. peltata*, Rss.*, *F. tahitiensis*, Waters, *F. philomela*, var. *adnata*, Busk, *F. tenuicosta*, MacG. †, which Levinsen removes from *Membraniporella*.

They all grow in regular rows, the zoœcia are similar in shape, with a wide sloping surface outside the area, which would be called by Lang the extra-terminal front wall. They each have in the area radiating ridges or ribs, between which are furrows with about four pores, the outer one being a slit in *figularis* and *clithridiata*. There are raised papillæ (fenestræ) at the end of the ray in *figularis*, J., *clithridiata*, W., *tahitiensis*, W., and these are covered with a thick dark membrane. Lang includes these in the pelmæ, but possibly they have a different function.

F. figularis has an oral aperture with the proximal edge but little curved (0·21 mm. wide in ordinary zoœcia), while the aperture of the ovicelligerous zoœcia is about the same shape, but larger (0·26 mm.). There are 21 tentacles. *F. clithridiata*, W., has a much smaller oral aperture (ordinary 0·1 mm., ovicelligerous 0·16 mm.). The ordinary aperture contracts, and the proximal end is triangular, whereas the aperture of the ovicelligerous zoœcia is the same shape as that of *F. figularis*. The shape of the aperture of *F. speciosa* is intermediate between that of *F. figularis* and *F. clithridiata*, the proximal edge forming a wide curved sinus; in the var. *carinata* the aperture of the ordinary zoœcia is 0·09 mm., ovicelligerous 0·11 mm. *C. tenuicosta*, MacG., has both the ordinary and ovicelligerous apertures the same shape and about the same size as those of *C. clithridiata*.

The ovicell, except in *F. tahitiensis*, Waters, has a large oval thin space on each side, while in *tahitiensis* there is an area at the distal end with marks somewhat like those of the zoœcial area. This is sometimes foreshadowed in *F. clithridiata*. In *C. latimarginata*, B., the pores radiate from the median line with the outer one much the larger, without any papillæ.

The vicarious avicularia of *F. figularis*, *F. clithridiata*, *F. philomela*, *F. speciosa*, *F. tenuicosta* are similar‡, occurring on all these species sometimes, yet on numerous

* (Oest.-Ung.), p. 171, pl. i. fig. 5.

† Tert. Poly. of Victoria, p. 56, pl. viii. figs. 15, 16.

‡ *Cribrendæcium tenuicostulatum*, Canu and Bassler, and *Figularia* (?) *crassicostulata*, C. & B., have similar avicularia.

large colonies none are found, a fact very noticeable in *F. figularis* from Plymouth. Also in the Musée Océanographique in Monaco of seven slides from between Fayal and Pico, three have no avicularia, three have one each, and one has four. From the study of recent forms we should say these form a group, although *F. figularis* has the large pore on the proximal end of the costa, whereas in *F. carinata* (Pl. XVII. figs. 8, 9) the pore is on the distal end, which in Lang's classification would place them far apart, but this raises the question as to whether the distal or proximal position of the large pelma on the costa is of more than specific value. In all these there are on the zoœcial area calcareous ridges or costæ, between which are furrows with about four pores in each, the outer being sometimes a slit. In many fossils it is impossible to decipher the structure between the costæ and to be sure whether there are pores or not. The raised papillæ are not in line with the furrows of pores and belong to the calcareous costæ, as do the spinous processes of *C. punctata*, *C. tubulifera*, Hincks, and are not homologous with the marginal spines of *C. radiata*.

From Plymouth I obtained specimens with the so-called testes of Jullien*, one occurring practically in each zoœcium hanging down from near to the operculum, it seems to be a thick-walled sac sometimes forming irregular compartments. There did not seem to be any similarity of structure to the oral glands, which occur in so many species; however, the sections prepared did not give the hoped for explanation, but it may have been the wrong season—at any rate, no spermatozoa were found. As I shall not be able to investigate this point further someone should take it up, for it is important and not solved.

F. clithridiata, Waters, *F. carinata*, W., *F. tahitiensis*, W., were all sent to me marked *C. figularis*.

The group is closely allied to *Diacanthopora*, Lang†, though the fossil avicularia are smaller.

Loc. Naples, Capri, Oran, Adriatic, Corsica, British and French coasts. Between Pico and Fayal (Atlantic).

Figulina carinata, sp. n. (Pl. XVII. figs. 8, 9.)

? *Cribrilina figularis*, var. *a* (*fissa*), Hincks, Brit. Mar. Poly. p. 196, pl. xxvi. fig. 8 (1880).

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* "Du Testicle chez la *Lepralia figularis*, Johnst.," Mem. Soc. Zool. de France, vol. i. (1888).

† Vol. iv. p. 231.

? *Figulina figularis*, f. *fissa* (Hks.), "Marcus. Bry. von den Aru Inseln," p. 427, pl. xxiv. fig. 4, Abh. Senckenb. Naturf. Gessellsch. vol. xxxv. (1922).

An interesting specimen from Foveaux Straits, N.Z., sent to me by Miss Jelly as *Cribrilina figularis*, I at one time considered was *C. clithridiata*, Waters, but while it may be an intermediate form it is now considered as a separate species.

The zoœcia have a plain sloping surface with a central area having about 11 costæ; there is no prominent peripheral perforated papillæ, though the ray may be slightly raised here. The slits between the costæ are not seen in one specimen to be perforated, but in another pores can be distinguished in places. There is a very pronounced central keel, and here the end of each ray has a small papilla alternate on the two sides. The operculum has a pronounced poster, but it is not as long as in *C. clithridiata*.

The ovicell is large, much raised, with a "pyriform fossa" on each side as in *F. figularis*, *F. clithridiata*, and usually a keel, it is closed by the operculum. Similar fossæ occur in *Flustra militaris*, Waters*, and in several Catenicellidæ.

Pergens† says there is a keel in *C. haueri* and Reuss‡ shows it, but not very pronounced. There are in *carinata* a few spatulate vicarious avicularia rather narrower than those of *F. figularis*. The avicularia occur where a fresh row of zoœcia is being intercalated, and there are other Cheilostomata in which the avicularia occur at the beginning of fresh longitudinal rows of zoœcia—for example, in *Schizoporella linearis*, Hass., the avicularia, which were mistaken by Hincks for ovicells, occur at the beginning of a fresh longitudinal row. The same is the case in *Biflustra delicatula*, Busk. In *S. discoidea*, Busk, from Naples and Rapallo, the first zoœcium of an intercalated row has, instead of the usual small semicircular avicularium, a large spatulate one, and this is seldom found in any other position. Also I§ have shown that in some species of *Steganoporella*, recent and fossil, two zoœcia usually grow from the distal end of a *B. zoœcium*, which, though not absolutely parallel with the phenomena in *S. linearis*, *S. discoidea*, and *Figulina carinata*, yet it is preparatory to a new row. Large avicularia also occur at the bifurcation in *Caberea boryii*, Aud., and *C. rostrata*, B.

* (N.S. Wales), p. 93, pl. iv. fig. 2.

† Plioc. Bry. von Rhodos. p. 20 (1887).

‡ (Oest.-Ung.), pl. i. figs. 1–3.

§ "Bry. from Aldinga," Quart. Journ. Geol. Soc. vol. xli. p. 292; and (Zanzibar), p. 498; also confirmed by Marcus for *S. haddoni*, Bry. von den Aru Inseln, p. 428 (1922).

Loc. Foveaux Straits, New Zealand; ? Aru Straits (*Marcus*), ? Singapora (*Hincks*).

Figulina tahitiensis, sp. n. (Pl. XVIII. fig. 1.)

Another specimen sent to me as *Cribrilina figularis* must have a new name, for, though the shape of the zoœcia, of the area, and of the oral aperture in both the ordinary (0·11) and the ovicelligerous zoœcia is the same as in British and Mediterranean *figularis*, there is very material difference in the ovicell, which has at the distal end an area with a number of large prominent papillæ at the end of the rays, and there are no large pyriform fossæ on each side, only often at each side not far from the aperture a relatively small pore. In one case there are also two small pores in the proximal part of the ovicell, which is closed by the operculum. This ovicellular area is somewhat foreshadowed in *F. clithridiata*, W.

It will be seen that the oral apertures are much smaller than those of *F. figularis*, but about the same size as those of *F. clithridiata*, W., while *F. carinata*, sp. n., is much smaller. None of the group have spines.

The raised papillæ are not in line with the radii of pores, and belong to the calcareous costæ as do the spinous processes of *C. punctata*, *C. tubulifera*, etc., and are not homologous with the marginal spines of *C. radiata*. The calcareous bar forms round the bar or the pore-disk of the papillæ.

Loc. Tahiti.

Figularia clithridiata, Waters.

Cribrilina clithridiata, Waters (N.S. Wales), p. 187, pl. v. fig. 1; pl. vi. fig. 2 (1887); *op. cit.* ser. 6, vol. iv. p. 5, pl. i. figs. 6–9 (1889).

This is very similar to *Cribrilina peltata*, Reuss*, if not identical with it. Reuss says that *peltata* is smaller than *C. haueri*, Rss., and *clithridiata* (0·5 mm. long) is smaller than *F. figularis*, J. (0·6 mm. long), so that we have these allies fossil and recent. *C. peltata* is about 0·57 mm. long.

Cribrilina latimarginata, Busk.

Cribrilina latimarginata, Busk, Chal. Exp., Zool. vol. x. pl. xxv. p. 131, pl. xxii. fig. 10 (1884); Waters, Suppl. Report, *op. cit.* vol. xxxi. p. 22, pt. i. figs. 11, 12 (1889).

Jolietina latimarginata, Jullien ("Les Costulides"), p. 8.

The specimens now examined from St. 320 all grow upon

* (Oest.-Ung.), p. 171, pl. i. fig. 5.

Foveolaria elliptica and not upon a coral as supposed by Busk.

Specimens decalcified show that just outside the area there are small oval chambers, one of which is close to each large pore of the area. These are about the size of pore-chambers, but how they could occur so high up seems strange and we do not yet know their function. The large pores round *Cribrillina chelys*, Koschinsky (as figured by Reuss in *Celleporaria radiata* *), are probably the same structure. My specimens of *C. chelys* from Brendola, N. Italy, have the avicularia in most places in great abundance and in varying positions and size.

Jullien would make of this a new genus *Jolietina*, but it does not seem based on any satisfactory characters, nor has he described it quite correctly, for the proximal edge of the operculum is straight. It is, however, possible that it will have to be removed from *Cribrilina*.

Loc. St. 320, Chall., 600 fath.; I also saw it in Paris from D. 188, north of Malouines, 135 met., 14th Sept.; Cape Horn, 260, 261 *a*, in the d'Orbigny collection with *Fasciculipora ramosa*, d'Orb., Falkland Is., 13735.

In conclusion, I must again express my thanks to Mr. Kirkpatrick for assistance in studying the Natural History Museum collections.

EXPLANATION OF THE PLATES.

Plate XVII.

Fig. 1. *Lepralia otto-mulleriana*, Moll. × 25. Part of the growing end, showing a calcareous front wall, upon which grow from the border of the zoœcium narrow calcareous nodulated growths, forming in older parts erect spinuous processes. From Mentone, p. 548.

Fig. 2. Do. do. × 25. Rather more fully formed zoœcia from the same piece, and here the nodules are seen in rows.

Fig. 3. *Puellina innominata*, Couch, var. *vicariata*, nov. × 85. Shows kenozoœcia with the same pattern as the complete zoœcia (*Distanescharella*, d'Orb.). In zoœcia (*a*) the costæ are shown plain as they usually appear, (*b*) shows them nodulated, examined in a strong light. From Singapore or Philippines, p. 559.

Fig. 4. *Puellina innominata*, Couch, var. *sexspinosa*. × 85. Shows kenozoœcia with the same pattern as the complete zoœcia. Pores not seen in all the furrows. From Naples.

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* "Bry. von Crosaro," Denk. Math. Nat. K. Akad. der Wiss. Wien, vol. xxix. 1869, p. 292, pl. xxx. fig. 9.

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A. W. Waters, del.

CRIBRILINIDAE.

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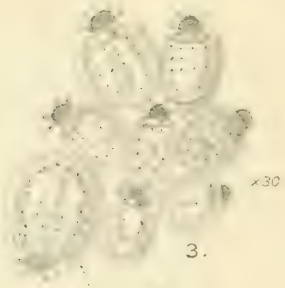
2.



3.

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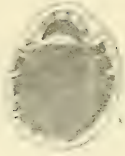

9.

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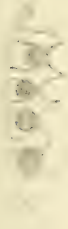
11.



12.

13.

14.

A. W. Waters, del.

CRIBRILINIDAE.

Fig. 5. *Lepralia otto-mulleriana*, Moll. × 25. Showing the growing edge with the frontal wall gradually extending to the oral aperture.
Fig. 6. Do. do. × 25. Near to the growing edge.
Fig. 7. Do. do. × 25. Primary and two zoœcia.
Fig. 8. *Figulina carinata*, sp. n. × 25. From Foveaux Straits.
Fig. 9. Do. do. × 85.

PLATE XVIII.

Fig. 1. *Figulina tahitiensis*, sp. n. × 25. From Tahiti.
Fig. 2. *Cribrilina radiata*, Moll. × 85. Primary zoœcium. From Capri.
Fig. 3. *Cribrilina punctata*, Hass. × 30. Showing primary and early zoœcia. From Plymouth.
Fig. 4. *Cribrilina nitido-punctata*, Smitt. × 25. Regenerating zoœcium.
Fig. 5. Do. do. × 25. Abnormal or blind zoœcium.
Fig. 6. *Puellina innominata*, var. *hincksii*, Friedl. × 25. Showing growth of super-layer as if commencing a fresh layer. From Madeira, p. 561.
Fig. 7. *Cribrilina punctata*, Hass. × 85. From Plymouth.
Fig. 8. *Cribrilina balzaci*, Aud. × 85. Primary. From Rapallo.
Fig. 9. *C. innominata*, Couch. × 50. Showing a zoœcium with the commencement of the calcareous growth near the border of the area, also a bridge below the oral aperture.
Fig. 10. Do. do. × 85. Showing the ligula projecting into the zoœcial aperture, also the two projections protecting the suboral pore.
Fig. 11. Do. do. × 50. Showing the zoœcium with the front wall nearly completed, and also the bridge as in fig. 8.
Fig. 12. Do. do. Showing the commencement of the rays at the border of the area, growing round the pores. Diagrammatic in so far as it is built up of what is seen in various places. It may be looked upon as fig 9 more magnified.
Fig. 13. *Kelestoma elongatum*, Marsson. × 50. Fossil from Moen.
Fig. 14. *Cribrilina nitido-punctata*, Sm. × 25. From "Cold Area." (*a*) Base of commencing ovicell, Nat. Hist. Mus. 99.7.1.1316.

LVIII.—*The Classification of the Siluroid Fishes belonging to the Genus* Glyptosternum *and Allied Genera.*

By N. ANNANDALE, D.Sc., C.I.E., F.A.S.B., Director, Zoological Survey of India.

IN a paper published in the May number of the 'Annals and Magazine of Natural History' (ser. 9, vol. xi. p. 608), Mr. Tate Regan has attempted to dismiss Dr. Sunder Lal Hora's * recent generic revision of certain Siluroid fishes belonging to the group or family Sisoridæ. As Dr. Hora's

* Hora, Rec. Ind. Mus. xxv. pp. 1–44, pls. i.–iv. (1923).

paper was based on abundant material, including a large proportion of the type-specimens, and as Mr. Regan's criticism depends mainly on an assumption for which there is no foundation, I have persuaded Dr. Hora to allow me to reply for him. The criticism of a third party, who has examined the material, has always some value in a dispute of the kind.

Mr. Regan has ignored Dr. Hora's criticism of the genera accepted by himself and has confined his own remarks (apart from quotations from original authorities, most of which had already been quoted by Dr. Hora) to four points in Dr. Hora's paper. I shall discuss these four points in order. The first is, perhaps, the most important, as the others depend upon it:—

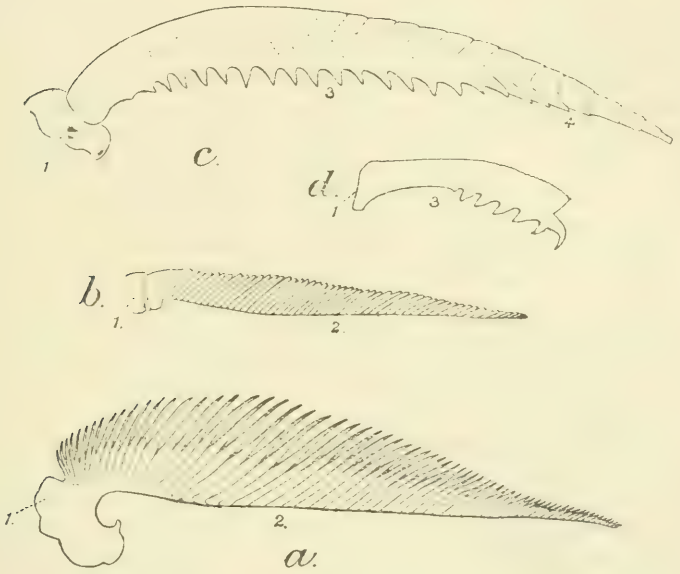
(1) McClelland * says, to requote an already-quoted passage, of the paired fins of his *Glyptosternon reticulatus*, "the first ray of the pectoral and ventral fins soft and pinnate, giving off soft-pointed cartilaginous rays along the anterior margin, *which are enveloped in the membrane of the fin.*" In spite of the last clause, which I have italicized, Mr. Regan has construed the statement as referring to striations of the skin on the ventral aspect of the rays. These striations of the skin are not correlated directly with the structure of the ray itself, which is invisible on the surface. Surely Dr. Hora is right in claiming that the words mean what they say and refer to an internal structure.

In the fish which my Indian colleague refers to the genus *Glyptosternum* the outermost rays of the pectoral and ventral fins have a very peculiar and characteristic structure, one feature of which is shown quite clearly by Dr. Hora in his fig. 1 on p. 37 of Rec. Ind. Mus. xxiv. The ray is completely cartilaginous except for the basal articular process, and is transversely grooved in such a way as to be practically segmented almost throughout its length. In certain species (fig. *a*), such as *Glyptosternum maculatum*, *G. stoliczkæ*, *G. andersoni*, *G. feæ*, and *G. macropterum*, its outer margin is produced into numerous soft, often almost hair-like processes, one of which corresponds to each segment, while its inner margin is smooth. In others (fig. *b*), such as *G. vinciguerræ* and *G. labiatum*, the processes are less well developed, but the general structure is precisely similar. So far as its outline is concerned, therefore, the ray agrees precisely, particularly in the species first mentioned, with both McClelland's description of *G. reticulatus* and Dr. Hora's figure of *G. labiatum*, neither of which, however, illustrates

* McClelland, Calcutta Journ. Nat. Hist. ii. pp. 584, 587 (1842).

the transverse grooves. This type of fin-ray is found in the same position in *Pseudecheneis*, about which there is no dispute. In the species Dr. Hora assigns to *Glyptothorax* no such peculiar structure is to be found.

In these the greater (basal) part of the corresponding ray is hard and bony, never grooved right across the ray. Only the distal extremity, which, as is usual, is at any rate softer, is segmented (fig. *c*). The outer margin of the ray may be



Outer pectoral rays dissected from fin-membrane, outer membrane uppermost.

a. Glyptosternum stoliczkæ (Day); *b. Glyptosternum vinciguerræ* (Regan); *c. Glyptothorax striatus* (McClelland); *d. Glyptothorax berdmorei* (Blyth). 1. Bony articular process of ray; 2. Cartilaginous ray in *Glyptosternum*; 3. Basal bony region of ray in *Glyptothorax*; 4. Soft distal segmented region of ray in *Glyptothorax*.

entirely smooth or finely serrated on the distal half, while the *inner* margin is produced into stout bony spines, which are always more or less distinctly retroverted. In some of the most highly specialized forms, such as *Glyptothorax striatus* and *G. pectinopterus*, the distal part of the outer margin of the basal region is expanded and marked with transverse striæ, most of which, however, do not extend

across the ray. This region is hard and bony, like the remainder of the basal part of the ray.

Further, it is clear from McClelland's descriptions of *G. reticulatus* and *G. striatus* that he was well aware that the outer pectoral ray differed in the two species. In that of *G. striatus* he says of the pectoral "first ray of the pectorals and ventrals broad, flat, and soft, except at the base; and enveloped in membrane *which is finely corrugated in pinnate folds below*, a few serrated points on the hinder margin of the first ray of the pectorals." In this statement he describes a totally different structure from that mentioned in the already-quoted description of *G. reticulatus*, as may be seen on comparing the words italicized in the two descriptions. It will be noted that in describing the outer pectoral ray as soft, McClelland excepts the basal part. His description is thus perfectly accurate in reference to the species assigned by Dr. Hora to *Glyptothorax*, especially to that group of species in which the outer pectoral and ventral rays are provided with a striated adhesive apparatus on their ventral aspect. I have myself examined numerous topotypes of *G. striatus*.

I wonder if Mr. Tate Regan has ever taken the trouble to dissect the pectoral fin of these fishes, or to compare Dr. Hora's figure of the dissected ray with McClelland's original description?

As Dr. Hora * has pointed out, the difference in the rays has an important adaptational significance, and proves that they are in different stages of evolution for complete adaptation to life in rapid-running water. To me, genera are no more than definite resting-places in a continuous progress. When they can be recognised on this basis it is as well to accept them.

Fresh figures of the outer pectoral ray in several species have been drawn under my supervision, and these drawings are reproduced here.

(2) Mr. Tate Regan quotes not only McClelland's original description of *Glyptosternum reticulatus*, but also Günther's criticism † of that species, with which he expresses himself in agreement. He fails, however, to note that McClelland stated that there were no spines in the fin of *Glyptosternon reticulatus*, and conveniently ignores Day's ‡ statement, "*Glyptosternum reticulatus*, McClelland, from Afghanistan (Cal. Journ. Nat. Hist.) is said to be closely allied to this

* Hora, Rec. Ind. Mus. xxv. pp. 5, 6 (1923).
† Günther, Cat. Brit. Mus. Fish. v. p. 185 (1864).
‡ Day, Fish. India, ii. p. 498 (1878).

species *, but to be *without spines*; and is probably an *Exostoma*."

(3) Mr. Regan refers to the specimen labelled *Exostoma berdmorei* in the collection of the Indian Museum, and doubts it being Blyth's original specimen. All that can be said on this point is that it was accepted by Day † in 1869 as the "typical specimen," that it was transferred from the old museum of the Asiatic Society of Bengal, which originally contained all of Blyth's types, to the Indian Museum in 1866, and that in 1869 Day noted that it was already in bad condition. Blyth very rarely marked his original specimens as types, and many of his labels were lost either by Day or previous to his time. But whether this specimen is to be regarded as the type of the species *Exostoma berdmorei*, the type-species of the genus ‡, or not, does not matter very much so far as Mr. Regan's argument is concerned, for Blyth's descriptions of the genera are quite clear so far as the general character of the pectoral spine or outermost ray of *Glyptothorax* and *Exostoma* is concerned. He says of *Glyptothorax*, "the pectoral spines broad and flat, and strongly pectinated behind." In his description of *Exostoma* on the following page he does not consider it necessary to comment on the pectoral fin, which is of a perfectly normal type.

(4) Mr. Regan lays great stress on McClelland's statement about *G. reticulatus* that "the under surface of the head and anterior portion of the body form a flat corrugated surface," but in his descriptions of fish of this little group McClelland draws a clear distinction between the development of a definite striated adhesive organ such as is found in *Pseudecheneis* and *Glyptothorax* (*vide* McClelland's description of *G. sulcatus*, *G. striatus*, and *G. pectinopterus*, op. cit.) and mere flat corrugated skin. The latter may be observed in any species of the Sisoridæ without any special apparatus of the kind, provided that the specimen has been hastily preserved in alcohol. It is, in fact, a pure artifect. I do not accept it as having generic value.

* Day here refers to "*Glyptosternum striatus*," under the description of which this remark is included (*op. cit.* 1878).

† Day, Proc. Zool. Soc. London, p. 526 (1869).

‡ The species is the first mentioned under the generic description by Blyth (Journ. As. Soc. Bengal, xxix. p. 155, 1860). See also Jordan, 'The Genera of Fishes,' pt. iii. p. 294 (1919).

LIX.—*A Revision of the Eastern Species of* Nosodendridæ [*Coleoptera*]. By G. C. Champion, F.Z.S.

This paper is based upon a study of the Eastern Nosodendridæ (a family included under Byrrhidæ by the older authors) contained in the British Museum collection. The species all belong to the one genus *Nosodendron*, Latr., from which *Dendrodipnis*, Woll., cannot be separated *. Three only of these insects had hitherto been named; but four out of the five described by Reitter in 1881 and 1886, all from Sumatra, co-types of two of which have been lent me by the Director of the Leiden Museum, are apparently represented from other Malayan localities. Like those found by myself in Central America, described by Sharp in 1902, the numerous eastern forms are readily grouped by the structure of the mentum. In *Nosodendron*, s. str., the sinuous grooves in the epipleura for the reception of the intermediate tarsi are wanting. In all the species examined the anterior margin of the ventral segments 2–5 are closely longitudinally notched or striated, the grooves on the fifth segment in some of them extending backward to near the apical margin. The gula is finely, transversely strigose, and is said by Sharp to form part of a stridulatory-organ. No external marks of distinction have been detected, but the ♀ ♀ often have the ovipositor extruded. The rougher setulose forms are almost invariably coated with the sappy matter in which they live, and it has been found necessary to clean with caustic potash nearly all the specimens examined. Of the twenty-one species enumerated in the accompanying key, four are wanting in the material examined—*N. ceylanicum*, Motsch. (No. 14), Ceylon, *N. calvum* (No. 5) and *N. vestitum*, Tryon (No. 18), New Guinea, and *N. australe*, Fauv. (No. 15), New Caledonia. The types of the described forms from New Zealand, and also those from Central and S. America, are contained in the British Museum.

Nosodendron.

Nosodendron, Latreille, Nouv. Dict. Hist. Nat. xxiv. p. 146 (1804); Dalla Torre, in Junk's Coleopt. Cat. Pars 33, p. 3 (1911).
Dendrodipnis, Wollaston, Ent. Monthly Mag. x. p. 33 (1873).

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* *Pseudonosoderma*, Heyd. (1885), included under Nosodendridæ by Dalla Torre in 1911, is a Tenebrionid; it was correctly located by Gebien in 1912.

1 (4). Elytra fasciculate; mentum without sulcus. [NOSODENDRON, Latr., s. str.]
2 (3). Intermediate and posterior tarsi free; elytral fascicles very prominent, erect ..... Species 1.
3 (2). Intermediate and posterior tarsi received into deep, narrow, curved sulci on the epipleura and abdomen respectively; elytral fascicles narrow, less prominent ..... Species 2.
4 (1). Elytra not fasciculate; tarsi as in No. 2. [Subgen. DENDRODIPNIS, Woll.]
5 (18). Mentum without sulcus.
6 (7). Head transverse, rounded and thickened along anterior margin; prothorax sharply margined; mentum almost smooth; body glabrous above, polished, the elytra in part seriato-punctate.. Species 3.
7 (6). Head subtriangular, truncate in front, the margin not thickened; mentum coarsely punctured.
8 (9). Elytra seriato-punctate; body glabrous ..... Species 4.
9 (8). Elytra confusedly punctate.
10 (13). Body glabrous above, polished.
11 (12). Elytra finely punctured, with coarser punctures across middle: species large ..... Species 5.
12 (11). Elytra extremely minutely punctate; prothorax sharply margined: species small ..... Species 6.
13 (10). Body more or less setulose above.
14 (17). Elytra without accessory row of punctures.
15 (16). Head bi-impressed anteriorly; intermediate and posterior tibiæ straighter: species large .... Species 7, 8.
16 (15). Head unimpressed; tibiæ curved: species smaller Species 9.
17 (14). Elytra (? except in Nos. 14, 15) with a distinct accessory row of punctures ..... Species 10–15.
18 (5). Mentum sharply sulcate or impressed.
19 (20). The groove transverse, semicircular ..... Species 16.
20 (19). The groove longitudinal, median.
21 (22). Head broader, transverse ..... Species 17.
22 (21). Head obliquely narrowed from the eyes forward, subtriangular.
23 (24). Elytral puncturing stronger ..... Species 18–21.
24 (23). Elytral puncturing extremely minute ..... Species 22.

1. *Nosodendron asiaticum.*

Nosodendron asiaticum, Lewis, Ent. Monthly Mag. xxv. p. 229 (1889).

Hab. JAPAN, on Nantaizan, Ichibosayama, and other mountains.

Smaller than the European *N. fasciculare*, Oliv., and more closely punctured above and beneath, the fascicles of fulvous setæ on the elytra denser and more erect. The cavities on the elytral epipleura and second ventral segment for the reception of the retractile intermediate and posterior tarsi in repose are shallow or wanting.

2. *Nosodendron disjectum*, sp. n.

Oval, gibbous, shining, finely fusco-pruinose, and also clothed with short, fulvous, erect setæ, the setæ on the elytra stout, blunt at the tip, and clustered into longitudinal, interrupted series of oblong fascicles; black, the antennæ and tarsi ferruginous; the upper surface densely, rather strongly punctured, the interspaces on the elytra shagreened and transversely asperate (appearing subgranulate when viewed in profile), the elytra also with a short row of coarser punctures near the suture below the base, the space between this and the suture smoother than the rest of the surface. Head subtriangular. Mentum coarsely punctured, not sulcate. Metasternum rather coarsely punctate. Ventral segments, except the cavities at the sides of 1 and 2, finely punctured, 2–5 closely notched along their anterior margin. Anterior tibiæ broadly widened outwards, denticulate externally, and feebly emarginate before the tip; intermediate and posterior tibiæ curved, denticulate externally, and toothed at the outer angle; intermediate and posterior tarsi received into deep sulci on the epipleura and second ventral segment respectively.

Length 4–4½, breadth 2½–2¾ mm.

Hab. India, Nilgiri Hills (*H. L. Andrewes*).

Five specimens. Less oblong than the European *N. fasciculare*, Oliv., and the Japanese *N. asiaticum*, Lewis, the clusters of fulvous setæ on the elytra narrower, less prominent, and arranged in interrupted lines; the elytra with a short accessory row of coarse punctures near the suture; the cavities for the reception of the intermediate and posterior tarsi sharply incised, not indefinite as in *N. asiaticum* and its allies. Abraded examples are recognizable by the rugose elytral sculpture.

3. *Nosodendron glabratum*, sp. n.

Oblong-oval, very broad, polished, glabrous; black, the antennal club obscure ferruginous; the head closely, finely, irregularly punctured, the elytra finely seriato-punctate in their median third, the mentum very minutely, sparsely punctate, the rest of the surface above and beneath (except the submentum, a few punctures at the sides of the metasternum, and a row of small notches along the anterior margin of the ventral segments 2–5) smooth. Head transverse, the anterior margin thickened and broadly rounded; eyes large. Prothorax sharply margined at the sides and at

the acute anterior angles. Elytra gibbous below the base, flattened in the scutellar region, and somewhat dilated at the sides anteriorly, the humeri rectangular. Mentum almost impunctate, flattened. Ventral segments 1 and 2 deeply excavate on each side. Tibiæ finely denticulate on their outer edge, the anterior pair very broad, deeply emarginate towards the apex.

Length 8, breadth 5 mm.

Hab. Solomon Isls., San Christoval, Makira Harbour (*Mus. Brit., ex H.M.S. 'Herald'*).

One specimen, acquired by the Museum in 1855. Easily distinguished from all the known members of the genus by the almost smooth mentum, the polished upper and under surfaces (that of the head excepted), the broadly rounded reflexed anterior margin of the head, the sharply-margined prothorax, and the abbreviated series of fine punctures on the elytra. *N. calvum*, Tryon, from British New Guinea and the Malayan *N. grande*, Reitt., are equally large forms, both having a coarsely punctured mentum.

4. *Nosodendron madagascariense.*

Nosodendron madagascariense, Alluaud, Bull. Soc. Ent. Fr. 1896, p. 36; List Coléopt. Malgache, p. 224 (1900).

Var. Narrower, the interstitial puncturing of the elytra much stronger.

Hab. Madagascar, Diego Suarez (*ex coll. Fry*), Antananarivo (*Kingdon and ex coll. Sharp*).

There are six examples of this species in the Museum: two labelled "type," one from the Sharp collection, two captured by Kingdon (var.), and one received from the Leicester Museum, ticketed "Richmond R., N.S. Wales," obviously in error, the genus not having been recorded from Australia. A rather broad, oblong-oval, gibbous, polished, subglabrous insect, with the upper surface sparsely, minutely, the head more distinctly, punctulate; the prothorax narrowly margined; the elytra finely seriato-punctate from a little below the base to the apex, the punctures becoming coarser towards the sides, the short sutural row wanting; the mentum coarsely punctured, not sulcate; the ventral segments 2–5 finely notched along their anterior margin, 1 and 2 deeply excavate laterally; the anterior tibiæ deeply arcuato-emarginate towards the apex and finely denticulate externally. According to Alluaud, this insect is common in the territory of Diego Suarez, occurring at various altitudes,

and it seems to be spread over the wooded littoral region of the N.E. portion of the island. The variety (? ♂) is narrower and has more distinctly punctured elytra.

5. *Nosodendron calvum.*

Dendrodipnis calva, Tryon, Coleopt. Brit. New Guinea, in Rept. Administr. ii., App. v. p. 109 (1892).

Hab. British New Guinea (*type*) (*Wallace, in Mus. Oxon.*).

This insect (length 8 mm.) is described as shining black, glabrous, finely punctured, without caducous pubescence; the head densely punctured, shallowly impressed on each side between the eyes; the labrum excavate in front, with the sides convex; the mentum coarsely punctured; the elytra with a wide, transverse, ill-defined band of large punctures about the middle.

6. *Nosodendron celebense*, sp. n.

Oblong-oval, broad, gibbous, polished, glabrous; black, the antennæ and tips of the tarsi ferruginous; the head (except at base) rather closely, minutely punctured, the prothorax (except at sides) and scutellum smooth, the elytra sparsely, minutely punctate, the punctures becoming obsolete towards the base and more distinct on the apical declivity. Head subtriangular. Prothorax rather sharply margined at the sides and at the anterior angles. Mentum coarsely punctured, without definite groove. Beneath almost smooth except for a few fine punctures on the metasternum and a row of small notches along the anterior margin of the ventral segments 2–5, the cavities at the sides of segments 1 and 2 deep. Tibiæ finely denticulate externally, the anterior pair broadly shallowly emarginate in their outer half, the other pairs obtuse at their outer apical angle.

Length $3\frac{1}{2}$–$4\frac{1}{4}$, breadth $2\frac{1}{4}$–$2\frac{3}{4}$ mm.

Hab. Celebes (*Mus. Brit.*).

Two specimens, acquired in 1858 and 1863 respectively. A small, glabrous, polished form, with the head, sides of prothorax, and elytra very minutely punctured, the prothorax sharply margined, the mentum coarsely punctured and without sulcus. In the allied *N.* (*Dendrodipnis*) *marginatum*, Reitt., type from Sumatra, the prothorax is finely margined; but in that insect the mentum has a deep semicircular impression.

7. *Nosodendron grande*.

Dendrodipnis grandis, Reitt. Mittheil. Münch. ent. Ver. v. p. 140 (1881); Notes Leyden Mus. viii. p. 216 (1886).

Hab. Sumatra (*type of Reitter*) and Borneo, Sarawak (*Wallace, in Mus. Oxon.*).

Very like *N. glabratum* in general facies and of about the same size (length $7\frac{1}{2}$–10 mm.), the elytra finely punctulate, the mentum very sparsely, coarsely punctate.

8. *Nosodendron nitidum*, sp. n.

? *Nosodendron nitidum*, Motsch. Bull. Mosc. 1863, 2, p. 432 (sine descr.)

Oblong-oval, broad, gibbous, very shining, clothed with minute squamiform hairs and scattered, very short, erect, pallid setæ; black, the antennæ and tips of the tarsi ferruginous; the head and prothorax closely, rather coarsely, the scutellum and elytra a little more sparsely, punctured, the elytra without accessory row of coarser punctures, the interspaces polished. Head subtriangular, faintly bi-impressed anteriorly, truncate in front; eyes large. Prothorax at the sides forming a continuous outline with the elytra. Elytra flattened along the suture at the base. Beneath sparsely punctured, the mentum coarsely so and without groove; the ventral segments 2–5 finely notched along their anterior margin, the cavities at the sides of segments 1 and 2 deep. Tibiæ finely denticulate externally, the anterior pair broad, deeply arcuate-emarginate towards the apex, the other tibiæ narrower, straight, rounded at the outer apical angle.

Length 7–8, breadth $4\frac{1}{4}$–5 mm.

Hab. India (*ex coll. Bowring*), Madras (*ex coll. Fry*).

Three specimens. This is perhaps the *Nosodendron* mentioned by Motschulsky under his description of *N. ceylanicum*:—"Une autre espèce plus grand du continent Indien est mon *N. nitidum*." It differs from *N.* (*Dendrodipnis*) *grande*, Reitt., in its narrower build, the more strongly punctured upper and under surfaces, and the closely punctured mentum.

9. *Nosodendron cœnosum*.

Dendrodipnis cœnosus, Woll. Ent. Monthly Mag. x. p. 34 (1873).
Nosodendron cœnosum, Lewis, op. cit. xxv. p. 229 (1889).

Hab. Japan, Nipon, Kiushu, Nagasaki, and Shiba.

Found in plenty, both larva and imago, in the rancid, exuding sap of a species of *Celtis*.

10. *Nosodendron oblongum*, sp. n.

Oblong-oval, convex, shining, clothed with extremely short, fine, erect setæ; black, the antennæ and tips of the tarsi ferruginous: above closely, strongly punctate, the punctures on the scutellum minute, those on the elytra coarser and more closely placed than those on the prothorax, becoming much finer on the apical declivity, the elytra also with a short accessory row of moderately coarse punctures near the suture below the base. Head subtriangular. Elytra oblong, compressed laterally. Mentum opaque, very coarsely, sparsely punctured. Ventral segments 1 and 2 with deep lateral cavities, 2–5 each with a row of short notches along their anterior margin, 5 with three deep oblique furrows on each side of the smooth triangular median space extending to near the apical margin. Anterior tibiæ broadly widened outwards, denticulate externally, and angulate near the tip; intermediate and posterior tibiæ curved, broad, asperate, denticulate externally, and armed with a curved tooth near the outer apical angle.

Length 5, breadth 2½ mm.

Hab. Burma, Ruby Mines (*Doherty*).

One specimen. Separable from the Japanese *N. cœnosum*, Woll., by its oblong, less convex shape, the very coarsely, sparsely punctate mentum, and the deeply sex-sulcate fifth ventral segment. A similar ventral character is also present in *N. marginatum*, var. *rugiferum*, and in *N. strigiferum*.

11. *Nosodendron strigiferum*, sp. n.

Oval, somewhat gibbous, shining, fusco-pruinose, and also clothed with very short, erect, pallid setæ; black, the antennæ and tips of the tarsi ferruginous; the upper surface densely, rather strongly punctured, the punctures becoming a little finer towards the apex, the elytra with a short accessory row of shallow, oblong, subconfluent, slightly larger punctures near the suture below the base. Head subtriangular. Mentum coarsely, closely punctured, not sulcate; the rest of the under surface (the median portion of the abdomen excepted), and the legs beneath, also coarsely punctured. Ventral segments 2–4 each with a row of short notches along their anterior margin, 5 coarsely, deeply, longitudinally furrowed across its entire width (the two grooves in the centre short) from the base to near the apex, the apex itself finely punctured. Anterior tibiæ broadly widened outwards, angulate towards the apex, and finely

denticulate externally; the other tibiæ curved, denticulate externally, and toothed near the outer angle.

Length 5, breadth $2\frac{3}{4}$ mm.

Hab. Perak (*Doherty*).

One specimen, more elongate than *N. punctulatum*, Reitt., the puncturing of the upper surface uniform and much stronger, the fifth ventral segment with numerous deep, longitudinal, pectiniform furrows extending from the base to near the apex. Less strongly and more densely punctured above than *N. oblongum*; the furrows on the fifth ventral segment straighter and more numerous (about 14 in all), there being six oblique ones only in *N. oblongum*; the body oval and more convex. This is one of three species of the genus found by Doherty at Perak, one of which has a curved impression on the mentum.

12. *Nosodendron sikkimense*, sp. n.

Oval, gibbous, subopaque, fusco-pruinose, and also clothed with extremely short, erect, pallid setæ; black, the antennæ ferruginous, the legs piceous; densely, finely punctured, the punctures on the head and prothorax a little coarser than those on the elytra, those on the latter here and there longitudinally or sinuously confluent and separated by narrow, dull, alutaceous interspaces, the short accessory row of punctures almost obsolete; the under surface, femora, and tibiæ coarsely punctured, dull, the mentum without groove, the cavities at the sides of ventral segments 1 and 2 deep, 2–5 finely notched along their anterior margin. Head subtriangular. Anterior tibiæ finely denticulate externally and broadly arcuato-emarginate towards the apex; the other tibiæ curved, strongly denticulate externally and armed with a curved tooth near the tip.

Length $4\frac{3}{4}$–5, breadth 3–$3\frac{1}{10}$ mm.

Hab. India, Rungbong Valley, Gopaldhara, Sikkim (*H. Stevens*).

Two examples. This is one of three species found by Mr. Stevens in Sikkim. The simply punctured mentum, feebly-margined prothorax, and rough surface-sculpture separate it from *N. marginatum*; and the more oblong, gibbous shape, subopaque surface, rugulose elytra, coarsely punctured ventral segments, &c., distinguish it from *N. punctulatum*. From *N. disjectum*, from the Nilgiris, it differs in its larger size, more oblong shape, dull surface, less rugose, non-fasciculate elytra, &c. The short accessory row of punctures on the elytra is just traceable.

13. *Nosodendron punctulatum.*

Dendrodipnis punctulatus, Reitt. Notes Leyden Mus. viii. p. 217 (1886).

Broad-oval, rather short, gibbous, shining, finely fusco-pruinose, and also clothed with very short, erect, pallid setæ; black, the antennæ ferruginous, the legs piceous; the upper surface densely, finely, the elytra more minutely, punctate, the latter with scattered distinctly coarser punctures intermixed and an abbreviated row of coarse, deep, punctures near the suture below the base. Head subtriangular. Prothorax feebly margined laterally. Mentum coarsely punctured, not sulcate. Metasternum coarsely punctured towards the sides. Ventral segments 1 and 2 deeply excavate laterally, 5 very finely punctured, 2–5 finely notched along their anterior margin. Anterior tibiæ broadly widened outwards, finely denticulate externally, feebly emarginate on the outer edge before the tip; intermediate and posterior tibiæ curved, broad, denticulate externally and with a curved tooth at the outer apical angle.

Var.? Narrower, the accessory row of punctures on the elytra not so coarse; ventral segment 5 with five parallel, longitudinal sulci on each side anteriorly. [Borneo and Perak.]

Length $3\frac{1}{2}$–5, breadth $2\frac{1}{4}$–3 mm.

Hab. Sumatra (*type of Reitter*); Java (*Mus. Brit.*); Borneo, Sarawak (*Mus. Brit., Mus. Oxon.*: both forms), Sandakan (*Baker*); Perak (*Doherty*: var.); India, Rungbong Valley, Gopaldhara, Sikkim (*H. Stevens*).

The above description is taken from a variable series of twelve examples—seven of the broader form and five of the narrower one, the former agreeing with Reitter's diagnosis, made from a single specimen from Sumatra. *N. marginatum* varies in a similar way in the sculpture of the fifth ventral segment. A small, oval, densely punctulate form, with a short accessory row of coarse punctures near the suture and a non-sulcate mentum. The two Javan examples are larger than the rest.

14. *Nosodendron ceylanicum.*

Nosodendron ceylanicum, Motsch. Bull. Mosc. xxxvi. 2, p. 432 (18 3 .

"Ovatum, gibbosum, punctulatum, brevissime cinereo-velutinum, nigrum, antennis tarsisque ferrugineis, his clava dilutiore; thorace valde transverso, punctato, antice angustato, angulis anticis obtusis, subprominulis, posticis subacuminatis; elytris thorace vix

latioribus, ovatis, dorso subelevatis, disperse punctulatis; corpore subtus pedibusque fortiter punctatis, abdomine segmento ultimo fere glabro. L. $1\frac{2}{3}$, lat. $1\frac{1}{6}$ l."

Hab. Ceylon, Nuwera Elia.

Not recognizable in the collection examined by me. The mentum is presumably without median sulcus.

15. *Nosodendron australe.*

Nosodendron australe, Fauv. Rev. d'Ent. xxii. p. 347 (1903).

Hab. New Caledonia.

Fauvel describes this species as of the size of *N. fasciculare* (length 5 mm.), but narrower, and about equally attenuate in front and behind; the prothorax longer and narrower, conical, strongly punctured; the elytra ovate, not fasciculate, more sparsely and more strongly punctured on the basal half of the dorsum than on the rest of their surface; the vestiture consisting of short golden setæ. The mentum is presumably simply punctured. The pectus is given as finely punctate. The conical prothorax should separate *N. australe* from any of the other species of the genus here noticed.

16. *Nosodendron marginatum.*

Dendrodipnis marginatus, Reitt. Notes Leyden Mus. viii. p. 218 (1886).

Oblong-oval, convex, moderately shining, fusco-pruinose, and clothed with very short, erect, pallid setæ; black, the antennæ ferruginous, the legs piceous or rufo-piceous; the head finely and rather closely, the rest of the upper surface densely, minutely punctulate, the prothorax and elytra with slightly coarser scattered punctures intermixed, the elytra with an abbreviated row of moderately coarse shallow punctures near the suture below the base and the minute general puncturing so dense as to give a dull appearance to the surface. Head subtriangular. Prothorax very narrowly margined laterally. Mentum with a deep, semicircular, or horseshoe-shaped (one example from Sarawak) impression in the middle, coarsely punctured at the base. Ventral segments 1–4 almost smooth down the middle, 1 and 2 with deep lateral cavities, 5 strongly punctured, the notches along the anterior margins of 2–5 becoming oblong and sulciform in shape towards the sides. Anterior tibiæ broadly widened outwards, angulate and finely denticulate externally; intermediate tibiæ curved, widened outwards, sharply denticulate externallly, and with a larger curved tooth above the outer angle.

Var. α. *rugiferum*, nov. The intermixed scattered punctures on the elytra slightly coarser; the fifth ventral segment with from 3–5 deep, parallel, longitudinal sulci on each side of the oblong median space extending from the base to near the apex, the grooves on 3 and 4 also elongated.

Var. β. *siamense*, nov. The intermixed scattered punctures on the prothorax and elytra coarser and more numerous; ventral segment 5 sculptured as in *N. marginatum*, type.

Length 4–5, breadth $2\frac{1}{2}$–3 mm.

Hab. Sumatra (*type of Reitter*); Java (*Mus. Brit.*); Borneo, Sarawak (*Mus. Brit.*); Batchian and Singapore (*Wallace, in Mus. Oxon.*); Perak (*Doherty*: var. α): Siam (*Mus. Brit.*: var. β); India, Rungbong Valley, Gopaldhara, Sikkim (*H. Stevens*: var. α).

The description here given is taken from twelve specimens —four of the typical form, five of the var. α, and three of the var. β. Reitter saw only a single example of it from Sumatra, and the sculpture of the upper surface and of the fifth ventral segment seems to be variable according to locality. The semicircular or ∩-shaped impression on the mentum is characteristic. The ventral rugæ vary in development in the var. α, and the three forms must be treated as belonging to one species. The Sikkim example (♀) differs in no way from one of the same sex captured at Perak. The type is in the Leiden Museum.

17. *Nosodendron batchianum*, sp. n.

Very like *N. hispidum* (infra); the upper surface not so shining, and the puncturing a little closer, especially that of the prothorax, the erect setæ very short, the accessory row of punctures on the elytra inconspicuous; the head broader and less triangular, the sides subparallel immediately in front of the eyes, the epistoma broadly truncate; the mentum narrowly sulcate, rather sparsely finely punctured in the middle, coarsely so in front and at sides; ventral segments finely, sparsely punctate, the row of oblong notches at the bases of 2–5 small, the cavities at the sides of 1 and 2 deep.

Length 5, breadth $3\frac{1}{8}$ mm.

Hab. Batchian (*Wallace*, *Mus. Brit.*, *Mus. Oxon.*).

Two examples. Separable from *N. hispidum* by the more transverse, less triangular head, and the closer puncturing of the prothorax, which is not so fine as in *N. hageni*. *N. vestitum*, Tryon, from New Guinea, which also has a longitudinally grooved mentum, is said to be finely punctured and uniformly clothed with short pubescence above.

18. *Nosodendron vestitum.*

Dendrodipnis vestita, Tryon, Coleopt. Brit. New Guinea, in Rept. Administr. ii., App. v. p. 109 (1892).

Hab. British New Guinea.

This species, described from a single example, is said to differ from *N. calvum* in its smaller size (length 5 mm.); the glossy, finely punctured surface, uniformly covered with short pubescence; the mentum with a conspicuous, mesial, longitudinal groove; the elytra without, the anterior surface of the femora and the sides of the abdominal segments behind with, coarse punctures.

19. *Nosodendron ritsemæ.*

Dendrodipnis ritsemæ, Reitt. Notes Leyden Mus. viii. p. 217 (1886).

Hab. Sumatra (*type of Reitter*); Penang and Java (*Mus. Brit.*).

There are twelve examples of this species in the Museum. It is separable from *N. hageni* by the broadly, deeply sulcate mentum, and the more sparsely and less finely punctured head and prothorax. The tibiæ are strongly denticulate externally, the anterior pair much widened and broadly arcuato-emarginate beyond the middle, the intermediate and posterior pairs armed with a curved tooth near the tip. The ventral segments 2–5 are sparsely punctured, and have each a row of small oblong notches along their anterior margin, and the cavities at the sides of 1 and 2 are deep. Five specimens of *N. ritsemæ* were recorded by Reitter, one of which has been lent me for examination.

20. *Nosodendron hageni.*

Dendrodipnis hageni, Reitt. Notes Leyden Mus. viii. p. 217 (1886).

Hab. Sumatra.

A co-type of this species before me is extremely like *N. ritsemæ*, differing from the latter in the more finely punctured head and prothorax, the puncturing of the latter much closer, and the narrowly sulcate mentum. In both insects the gibbous elytra are rather sparsely, somewhat finely punctured, and have a slightly curved short row of coarser punctures near the suture below the base, the interspaces being rather dull and alutaceous.

Six specimens of *N. hageni* were seen by Reitter: the one lent me cannot be matched in the Malayan material in the British Museum.

21. *Nosodendron hispidum*, sp. n.

Oval, gibbous, shining, somewhat thickly clothed with short, erect, pallid setæ; black, the antennæ ferruginous; the entire upper surface somewhat closely, strongly punctured, the interspaces smooth, the elytra with a short accessory row of coarser punctures near the suture below the base. Head obliquely narrowed from the eyes forward, subtriangular. Prothorax finely margined. Beneath shining; mentum with a narrow, deep, median furrow, coarsely punctured; metasternum coarsely punctured laterally; ventral segments almost smooth down the middle, 5 finely punctate, 2–5 each with a row of short oblong notches along their anterior margin, the cavities at the sides of 1 and 2 deep. Tibiæ strongly denticulate externally, the anterior pair emarginate beyond the middle, the intermediate and posterior pairs curved, toothed near the outer angle.

Length $4\frac{3}{4}$–$5\frac{1}{2}$, breadth $2\frac{3}{4}$–$3\frac{1}{4}$ mm.

Hab. S. India, Bangalore (*Mus. Brit.*); Burma (*Mus. Brit.*), Bhamo (*Fea, ex coll. Fry*); Tenasserim (*Mus. Brit.*); Malacca [type] and Siam (*ex colls. Sharp and Castelnau*); Tonkin and Annam (*Salvaza*).

Numerous examples. This seems to be the commonest representative of the genus in S. India and the neighbouring regions eastward. There is a certain amount of variation in the development of the median sulcus of the mentum, and in the strength of the transverse striation of the gula; these characters, however, are variable in specimens from the same locality, and they cannot be of specific value. *N. hispidum* is certainly not referable to any of the species of the genus enumerated by Reitter in 1886, and *N. ceylanicum*, Motsch., would appear to be a smaller insect with a non-sulcate mentum. The Japanese *N. cœnosum*, Woll., also has a simply punctured mentum, though it is very like *N. hispidum* in other respects.

22. *Nosodendron agaboides*, sp. n.

Oblong-oval, convex, finely pruinose; black, the antennæ ferruginous, the legs piceous; the head, prothorax, and scutellum shining, and closely, finely, the elytra opaque and extremely minutely, punctured, the interspaces of the latter densely alutaceous, the short accessory of larger punctures just traceable. Head subtriangular, unimpressed. Beneath shining; mentum with a rather broad, deep, median sulcus; metasternum and abdomen almost smooth, the ventral

segments 1 and 2 with deep lateral cavities, 2–5 each with a row of oblong notches along their anterior edge. Anterior tibiæ much widened outwards, very finely denticulate externally, emarginate towards the tip; the other tibiæ curved, denticulate, and toothed near the outer angle.

Length $4\frac{1}{2}$, breadth $3\frac{1}{4}$ mm.

Hab. Penang (*Lamb, ex coll. Pascoe*).

One specimen, somewhat abraded. This insect has the general facies of a small black *Agabus*. It is recognizable amongst the species here enumerated by the opaque, alutaceous, extremely minutely punctate, moderately convex elytra, the shining head, prothorax, and under surface, and the deeply sulcate mentum. The allied *N. ritsemæ*, Reitt., which also occurs at Penang, has gibbous, much more strongly punctured elytra, a distinct accessory row of coarser punctures near the suture, and the under surface not nearly so smooth.

LX. — *On some Mammals from Simalur Island, West of Sumatra, collected by Mr. E. Jacobson.* By Oldfield Thomas.

I owe to the kindness of Mr. E. Jacobson, with the consent of Prof. van Oort, the opportunity of examining a number of mammals which the former had collected in the island of Simalur for presentation to the Leyden Museum.

A list of mammals from the island obtained by Dr. Abbott was published by Miller in 1903 *, and of the species there mentioned, *Macaca fusca*, Mill., *Megaderma spasma*, L., *Myotis muricola*, Hodgs., *Paradoxurus hermaphroditus*, Pall., *Rattus neglectus*, Jent. (form representing *R. simalurensis*, Mill.), *R. ephippium*, Jent. (representing *surdus*, Mill.), and *Sus vittatus*, M. & S., were obtained by Mr. Jacobson, the rats and *Myotis* in considerable numbers.

In addition to these, specimens were collected of the *Pteropus* observed by Dr. Abbott, of *Cynopterus brachyotis angulatus*, Mill., *Macroglossus minimus sobrinus*, Mill., *Rhinolophus refulgens*, K. And., *Hipposideros larvatus*, Horsf. (very numerous), *H. galeritus*, Cant., *Kerivoula hardwickei*, Horsf., *Emballonura monticola*, Temm., and a considerable number of a *Cheiromeles*.

Of these mammals two, the *Pteropus* and *Cheiromeles*,

* P. U.S. Nat. Mus. xxvi. p. 478.

appear to me to deserve special names, and may be described as follows :—

Pteropus hypomelanus simalurus, subsp. n.

General characters as given under *a* of K. Andersen's synopsis of the subspecies of *P. hypomelanus* *, and therefore at once separable from all the other races of the species placed by him under *b*. But the size, instead of being less than in other subspecies, as in the neighbouring *enganus*, or normal as in the Mergui *geminorum*, is markedly larger than that usual in the various races of *hypomelanus*.

Forearm upwards of 140 mm., six specimens having the following lengths :—141, 143, 143, 145, 146, 149. While Andersen gives for *enganus* 121–133·5 and for *geminorum* 134–137.

Head, both above and below, black, with a few whitish hairs intermixed, conspicuously darker than in other races. Mantle varying from dull golden to chestnut. Back and rump black, matching the crown. Under surface black with a collar of dull tawny and a tawny or chestnut wash down the middle of the chest.

Skull as usual, though noticeably larger than in *enganus*.

Dimensions of the type :—

Forearm 146 mm.

Ear 25. Third finger, metacarpus 97; first phalanx 71.

Skull: greatest length 68; condylo-basal length 65·3. Zygomatic breadth 35.

Hab. Simalur Island, N.W. of Sumatra, and neighbouring islets. Type from Pulu Tapah.

Type. Adult male. B.M. no. 23. 10. 7. 5. Original number 482. Collected April 1913 and presented by Mr. E. Jacobson. Twenty specimens examined.

Evidently a very distinct local race of the widely spread *P. hypomelanus*.

It is a remarkable fact that while the subspecies of the next island of the chain to the west of Sumatra should be characterized by its comparatively small size, that of Simalur actually averages larger than ordinary *P. hypomelanus*.

Cheiromeles jacobsoni, sp. n.

General characters essentially as in *C. torquatus*, but the size decidedly less, the forearm rarely attaining 74 mm., as compared with 80 or upwards in true *torquatus*, and the skull still more obviously reduced.

* Cat. Chir. B.M. (2) i. p. 104 (1912).

Degree of hairiness about as in *torquatus*, the scanty hair similarly black.

Skull throughout smaller and weaker than in *torquatus*, the occipital crest less developed. Incisors less broad, and canines shorter, those of the male 5 mm. in length as compared with 5·6, and of the female 3·8 as compared with 4·3, measured from cingulum to tip. Molars conspicuously smaller.

Dimensions of the type, measured on the spirit-specimen :—

Forearm 74 mm.

Head and body 125 ; tail 54 ; ear 30; third finger, metacarpus 76, first phalanx 46, second phalanx 38 ; lower leg 33 ; hind foot (c. u.) 26.

Skull, greatest length 32·7 ; condylo-basal length 28·5 ; intertemporal breadth 8·2 ; mastoid breadth 21·5; front of canine to back of m^3 11·2 ; cheek-teeth only 9·1.

Hab. Simalur Island. Type from Lugu.

Type. Old male in spirit. B.M. no. 23. 10. 7. 9. Collected May 1913 and presented by Mr. E. Jacobson. Twenty specimens examined.

This island-race of the well-known *Cheiromeles torquatus* is readily distinguishable by its smaller size, but does not appear to differ externally in other respects.

Considering the great uniformity among themselves of the *Cheiromeles* of most other parts of the East Indian Archipelago, the considerable reduction in size of that of Simalur, especially in the skull and dentition, is very noticeable. *C. parvidens*, Miller, is also small, but geographically it is impossible that it should have any special relationship to the Simalur bat.

Named in honour of Mr. Jacobson, to whom the discovery of this well-marked species is due.

LXI.—*A new Species of* Neosteus *from Rio de Janeiro, with Notes on the American Species of* Ilisha *and* Neosteus. By J. R. Norman.

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Neosteus ternetzi, sp. n.

Depth of body $2\frac{2}{3}$ to $2\frac{3}{4}$ in the length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$. Ventral profile much more convex than dorsal. Snout shorter than diameter of eye, which is $2\frac{2}{3}$ to 3 in length of head ; maxillary not reaching middle of eye ; lower jaw projecting. Ridges on upper surface of head parallel or a

little convergent posteriorly ; greatest distance between them $3\frac{1}{4}$ to $3\frac{3}{4}$ in diameter of eye. 23–25 gill-rakers on lower part of anterior arch. 33–36 scales in a longitudinal series ; ventral scutes 16–19+6–7. Dorsal 16 ; origin a little nearer to end of snout than to posterior end of anal. Anal 37–40 ; origin below or a little behind end of dorsal; length of base about $2\frac{3}{4}$ in length of fish. Pectoral about $\frac{2}{3}$ length of head. Pelvics shorter than eye, inserted nearer origin of anal than base of pectoral. Anal and caudal fins and tip of dorsal powdered with black dots.

Five specimens, 125–132 mm. in total length, collected at Rio de Janeiro by Dr. C. Ternetz.

This species appears to be closely related to *N. ditchela* from the Indo-Pacific, from which it may be distinguished chiefly by the deeper body, longer anal base, and more posterior insertion of pelvics.

In my revision of the genus *Ilisha* etc.*, I placed *I. furthii*, Steindachner, and *I. panamensis*, Steindachner, in the genus *Neosteus* ; but I had seen no examples of these species. I have since examined three specimens received as *I. furthii*, and find that they possess a ligament between the præmaxillary and maxillary ; this species, which is described below, is therefore a true *Ilisha*. These examples further suggest that *I. panamensis* is not distinct from *I. furthii*.

Ilisha furthii.

Pellona furthii, Steindachner, Sitzber. K. Akad. Wiss, lxx. Abt. i., 1875, p. 388.

Pellona panamensis, Steindachner, *t. c.* p. 389.

Depth of body $2\frac{4}{5}$ to $3\frac{1}{3}$ in the length, length of head $3\frac{3}{4}$ to $3\frac{4}{5}$. Ventral profile more convex than dorsal. Snout shorter than diameter of eye, which is 3 to $3\frac{1}{2}$ in length of head; maxillary extending to below middle of eye or not quite as far ; lower jaw strongly projecting. Ridges on top of head parallel posteriorly ; greatest distance between them $3\frac{1}{3}$ to $3\frac{1}{2}$ in diameter of eye. 22–24 gill-rakers on lower part of anterior arch. 54–58 scales in a longitudinal series ; ventral scutes 22–24+12–13. Dorsal 16–17 ; origin nearer end of snout than base of caudal. Anal 48–51 ; origin a little behind dorsal, or below its posterior rays ; length of base $2\frac{3}{5}$ to 3 in length of fish. Pelvics shorter than eye, inserted a little nearer base of pectoral than origin of anal. Tips of dorsal and pectorals and edges of anal and caudal blackish.

Three specimens, 275–300 mm. in total length, from Panama.

* Ann. & Mag. Nat. Hist. (9) xi. pp. 1-22 (1923).

LXII.—*A Preliminary Synopsis of the* Asteriidæ, *a Family of Sea-Stars* *. By W. K. Fisher, Director, Hopkins Marine Station, California.

[Concluded from p. 258.]

3. Plates of the abactinal surface of ray have the appearance of forming rather definite longitudinal series, even when the dorsolaterals are not in regular series (in this case the dorsolateral region is narrow and dominated by the broad carinals and superomarginals); abactinal plates generally with several spinelets or granules, but, if with only one spine, then this is small and not conspicuous.

a^1. Adambulacral spines never carry pedicellariæ singly or in clusters, although straight pedicellariæ may occur on oral spines and on furrow-margin of adambulacral plates.

b^1. Adambulacrals diplacanthid.

c^1. Actinal plates in 1 series (or with rudiment of second) dominated by the inferomarginals which form the ventrolateral margin of ray; no large unguiculate straight pedicellariæ; crossed pedicellariæ scattered, not in clusters or wreaths around abactinal spines.

d^1. Primary apical plates of disk not enlarged; superomarginals conspicuously broader than inferomarginals.

e^1. Carinals and superomarginals of exaggerated width in proportion to length; dorsolateral area broad, the plates in 3 to 5 series on each side of the carinals; one madreporic body; not fissiparous; superomarginal plates without beaded area on surface; (gonoducts open dorsally, those of male with a proximal swelling; interbrachial septa heavily calcified. Includes *Cælasterias australis*, Verrill, 11 rays). Type, *S. striatus*, M. & T..... *Stichaster*, M. & T.

e^2. Carinals and superomarginals broader than other plates, but not excessively so; dorsolateral area narrow, the plates in a single straight or zigzag series (altogether 3 series of abactinal plates); fissiparous; multiple madreporic bodies; superomarginal plates with beaded surface. Type, *Stichaster polyplax*, M. & T. ..... Verrill †. *Allostichaster*,

e^3. Young *Podasterias* may lead here; see under section 4.

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* Published with permission of the Secretary of the Smithsonian Institution.

† Includes *Allostichaster insignis* (Farquhar).

d^2. Primary apical plates conspicuously enlarged, occupying all of slightly sunken central portion of disk; superomarginals not conspicuously broader than inferomarginals; abactinals and marginals sparsely granulated, subhexagonal, imbricated in 7 very regular series; actinal plates with short spinelets, a second series present at base of ray only. Resembling, abactinally, a short-rayed *Zoroaster*. Type, *N. eustichus*, Sladen = *N. talismani* (Perrier) ..... [Sladen *. *Neomorphaster*,

c^2. No actinal plates; superomarginals not conspicuously broader than inferomarginals; abactinal plates rather closely imbricated in 5 definite longitudinal series; papular areas small; inferomarginals with a transverse oblique comb of flattened spines; abactinal plates with a group of 5 or 6 small spinelets; plates very regular; tube-feet quadriserial proximally. Founded upon one very small specimen (R. 17 mm.); adult unknown. Type, *Gastraster margaritaceus*, Perrier ..... [Perrier. *Gastraster*,

c^3. Actinal plates in two or more prominent series forming the actinal or the actinal and actinolateral surfaces of ray (and not dominated or overhung by the inferomarginals).

d^1. Large unguiculate straight pedicellariæ; actinostome sunken, the adoral carina long, consisting of more than three pairs of contiguous postoral adambulacral plates. Type, *Asterias sulcifera*, Perrier = *A. lurida*, Philippi ..... [Sladen †. *Cosmasterias*,

d^2. No large unguiculate pedicellariæ; actinostome not sunken; adoral carina short, consisting of one or two pairs of contiguous postoral adambulacral plates.

e^1. Plates small, with numerous small granuliform spinelets; abactinal skeleton close-knit, with small papular areas in the equivalent of four to six dorsolateral series (though usually irregularly distributed); carinal plates regular; superomarginals small and with numerous small granuliform

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* This genus, which includes *Calycaster*, Perrier, founded upon a very immature form, is so different from the general run of Asteriidæ that it deserves segregation in a separate subfamily, Neomorphasterinæ, nov. It differs from the Zoroasteridæ in possessing crossed pedicellariæ and in lacking dimorphic adambulacral plates.

† *Quadraster*, Perrier, 1896, type *Stichaster felipes*, Sladen, belongs here. Perrier compared his genus with *Stichaster*.

spinelets; equivalent of two or three longiseries of actinal plates; adambulacral plates proximally diplacanthid and triplacanthid. Type, *Stichaster roseus* (Müller), Sars ..... [Verrill, *Stichastrella*,

e^2. Plates large, with coarse, often capitate, globose spines and tubercles; abactinal skeleton with large more or less irregular meshes in two dorsolateral series on either side of the irregular carinal series; superomarginals with one to several capitate stout spines; inferomarginals with one to three spines; one to three series of actinal plates, usually two or three; one well-defined though sometimes irregular series of dorsolateral plates; adambulacrals very regularly diplacanthid. Type, *Uniophora globifera*, Gray = *Asterias granifera*, Lam. ..... *Uniophora*, Gray *

b^2. Adambulacral plates monacanthid.

c^1. Dorsolateral plates numerous, three- or four-lobed, in three irregular series; superomarginals not conspicuously broader than the actinals; inferomarginal plates monacanthid and diplacanthid, not forming a sharp ventrolateral edge to ray; rays long, rather slender; crossed pedicellariæ scattered; no actinal plates. (For further details see under section 4.) Type, *Hydrasterias verrilli*, Fisher, Hawaiian Islands .. [gen. nov., *Tarsastrocles*,

c^2. Dorsolaterals not very numerous, trilobed, in one or two fairly regular series, more or less concealed by integument; superomarginals very broad; inferomarginals (each bearing an oblique comb of two to four prominent spines) form a sharp ventrolateral border to ray; an inconspicuous series of actinal plates; rays short and thick; gonads open ventrally. (See also under section 4.) Includes *Stichorella*, Koehler†. Type, *C. asterinoides*, Perrier.. [Perrier, *Calvasterias*,

a^2. Adambulacral spines carry pedicellariæ singly or in clusters; one or two series of actinal plates.

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* *Uniophora globifera*, Gray, is apparently the same species as the earlier *Asterias granifera*, Lamarck, as I have examined a cotype of *globifera* and photographs of the type, as well as photographs of the types of *Asterias granifera*, Lamarck, *A. fungifera*, Perrier, and *A. sinusoida*, Perrier. The last two species apparently belong to *Uniophora*. I do not know what Gray's *Margaraster* is. At first sight it appears to be a synonym of *Uniophora*, but is described as having monacanthid adambulacrals. If it is anything more than a "book" genus, it would appear to be a synonym of *Pisaster*.

† See Fisher, Ann. & Mag. Nat. Hist., Dec. 1922, p. 597.

b^1. Ambulacral pores not unusually large; gonads opening ventrally; adambulacrals diplacanthid or mixed diplacanthid and monacanthid. *Leptasterias camchatica* (Br.), *vancouveri* (Perrier), *æqualis* (Stimp.), *hexactis* (Stimp.), and others have abactinal plates in more or less evident longiseries. See section 4, a^1, b^1, c^2 ..... [Verrill. *Leptasterias*,

b^2. Ambulacral pores unusually large (quadriserial); abactinal and marginal plates broad, lobed, closely imbricated, with very small papular areas; dorsolateral plates in three series proximally; plates closely covered with clusters of minute spinelets; two series of actinals proximally; adambulacrals mostly diplacanthid; gonads unknown, Type six-rayed. Type, *Leptasterias macropora*, Verrill. [Verrill. *Stenasterias*,

4. Abactinal skeleton an irregular net with meshes of various sizes, the plates being sometimes closely but irregularly imbricated by their lobes; abactinal plates not in rather obvious longitudinal series (but occasionally in more or less evident transverse series); carinal series usually but not always distinguishable, and frequently very irregular.

a^1. Adambulacral spines provided with clusters of straight or of straight and crossed pedicellariæ, or, exceptionally, with only single pedicellariæ (see note under *Leptasterias*).

b^1. Adambulacrals diplacanthid, or mixed diplacanthid and triplacanthid, or mixed diplacanthid and monacanthid.

c^1. Gonads opening dorsally; species never carry eggs and young (so far as known).

d^1. A single series of actinal plates, either spineless and more or less superficially invisible, or with a single small spine; a single series of actinal papular areas alternating with the actinal plates; furrow-spine of alternate adambulacral plates more or less advanced into furrow; inferomarginal plates strictly actinal in position, the superomarginals defining ambitus; crossed pedicellariæ not unusually large. Type, *A. rubens*, Linn... *Asterias*, Linn.*.

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* Includes *Allasterias*, Verrill (type *A. rathbuni*, Verrill = *Asterias amurensis*, Lütken), and *Parasterias*, Verrill (type *P. albertensis*, Verrill). *Asterias rubens* is a typical *Allasterias*. *Asterias amurensis*, the type of *Allasterias*, is only slightly different from *rubens*, the type of *Asterias*, s. s.

Parasterias, the type-specimen of which I have examined, has the adambulacral armature and other features as in *Asterias*. Professor Verrill overlooked the furrow-spine of the alternate adambulacral plates of *Parasterias*. The armature is alternately triplacanthid and diplacanthid at the base of the ray and diplacanthid distally. The furrow-spine of alternate plates is more advanced into the furrow, as in typical

d^2. Actinal plates in three to five prominent series (each plate bearing one or two stout spines), separated by series of papular areas; furrow-spine of alternate adambulacral plates often somewhat advanced into furrow; inferomarginals usually not actinal but lateral in position; crossed pedicellariæ not unusually large. Type, *A. troschelii*, Stimpson .. [Verrill *. *Evasterias*,

d^1. No actinal plates; with unusually large, slender-jawed, crossed pedicellariæ; abactinal skeleton weak; marginal plates strong, with one prominent superomarginal and one still longer inferomarginal spine; adambulacral plates mostly diplacanthid, with sometimes numerous straight pedicellariæ along furrow-margin; some of these occasionally attached to base of furrow-spines, *but not usually*. Type, *Asteracanthion linckii*, M. & T. ..... *Urasterias*, Verrill.

c^2. Gonads opening ventrally; many species known to carry eggs and young; abactinal skeleton more or less open, the dorsolateral plates usually irregular, but spines sometimes in poorly defined longiseries; spines usually small, normally with a small or fairly thick collar of pedicellariæ; crossed pedicellariæ without enlarged teeth on the moderately broad terminal lip; one, or in large species two, series of actinal plates; adambulacrals diplacanthid or mixed diplacanthid and monacanthid; adambulacral pedicellariæ normally in clusters on the spines, but occurring singly and even very sparingly in individuals which have very few pedicellariæ elsewhere on body. Type, *Asteracanthion mülleri*, Sars ..... [Verrill †. *Leptasterias*,

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Asterias, while the abactinal, marginal, and actinal plates are essentially as in *rubens* and close allies. The actinal plates of the ray are very small. For six-rayed "*Asterias*" see *Leptasterias*.

* Large specimens of *Leptasterias* may lead to this section; but in *Leptasterias* the gonads open ventrally and the actinal area is narrow, with not more than two series of plates; rays 6.

† This genus includes *Ctenasterias*, Verrill (type *A. cribraria*, Stimpson = *A. groenlandica*, Sars). Some of the other species are:—*Leptasterias polaris* (M. & T.) [= *Asterias acervata borealis* (Perrier), Verrill]; *L. polaris acervata* (Stimpson); *L. polaris katherinæ* (Gray); *L. camtschatica* (Brandt) [= *Asterias multiclava*, Verrill]; *L. merriami* (Verrill, as *Orthasterias*); *L. arctica* (Murdoch); *L. alaskensis*, Verrill [or *L. epichlora* (Brandt), Verrill], with numerous subspecies; *L. hexactis* and *L. æqualis*, Stimpson. These are mostly North Pacific-Bering Sea species. *L. maconi*, Verrill, the type of which I have examined, seems to be a small six-rayed *Evasterias troschelii*; *L. obtecta*, Verrill, is apparently an individual variant of *L. groenlandica*. The inclusion of the *polaris–acervata–katherinæ* group in this genus is on the basis of the structure of the gonad,

b^2. Adambulacral plates monacanthid; with actinal plates in one inconspicuous series or lacking, and gonads opening ventrally (pædophoric); size small; pedicellariæ on adambulacral spines rather few and inconspicuous. (Formæ of several species.) ..... [Verrill. *Leptasterias*,

a^2. Adambulacral spines devoid of attached pedicellariæ, although large and small straight pedicellariæ may occur on the surface of the plates or on fleshy peduncles attached to plates near base of spines; clusters of the latter in dried specimens occasionally appear to spring from the spine-sheath, but in reality do not.

b^1. Adambulacral plates diplacanthid, at least at base of ray; rarely triplacanthid.

c^1. Crossed pedicellariæ unusually large, the jaws narrow and rather definitely hooked terminally; dorsolateral skeleton a very delicate and irregular meshwork, which may degenerate into more or less disconnected plates; marginal plates conspicuously larger than dorsolateral; carinal and dorsolateral spines acicular, isolated, without wreaths of pedicellariæ (except a few distal carinals in some old specimens).

d^1. Crossed pedicellariæ very large and of unusual form, with slender serrate jaws terminating in an unexpanded unguiculate tip; marginal spines prominent, acicular, one to a plate, the inferomarginals with a very large cluster or cushion and the superomarginals with a wreath of crossed pedicellariæ; very numerous, large, compressed-ovoid, straight pedicellariæ; gonads opening just above superomarginal plates in interbrachial angle. Type, *Asteracanthion linckii*, M. & T. ..... *Urasterias*, Verrill.

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which opens ventrally, and on that of the skeleton, which differs from the skeleton of typical *Asterias*, particularly as regards the marginal and actinal plates, and the adambulacral armature. Since *polaris* was described as an *Asteracanthion*, and is a *Leptasterias*, it does not compete with the prior *Asterias polaris*, Sabine, 1824. The substitution of *acervata* in the binomial combination, as adopted by Verrill (entirely justified on his premises), is therefore not necessary.

The clusters of pedicellariæ (both crossed and straight, or either in predominance, or either alone) are a characteristic feature of *Asterias*, s. s., *Evasterias*, *Leptasterias*, and *Stenasterias*. Certain individuals of *Leptasterias* (e. g., in *L. littoralis*), which vary in the direction of few pedicellariæ, may almost or quite lack pedicellariæ on the adambulacral spines (or in dried specimens lose the few they may have had). The character is fundamental, and the exceptions are individual or varietal rather than specific. *L. groenlandica* of the Arctic Atlantic region usually lacks these pedicellariæ; Bering Sea specimens have abundant adambulacral spine pedicellariæ.

d^2. Crossed pedicellariæ smaller, with relatively stouter jaws, scattered thickly over the abactinal and lateral surfaces, *but not in wreaths or clusters* on the abactinal or marginal spines; superomarginals monacanthid; inferomarginals diplacanthid, or mixed monacanthid and diplacanthid distally; gonads opening just above superomarginal plates a short distance from base of ray. Type, *Asterias panopla*, Stuxberg ..... *Icasterias*, gen. nov.

c^2. Crossed pedicellariæ not unusually large, but small, with blunt, terminally spatulate, denticulate jaws—the conventional type.

d^1. Abactinal plates and spinelets well developed.

e^1. Both series of marginal plates normally developed, easily distinguishable.

f^1. No actinal plates*; dorsolateral plates numerous, irregular, with small spinelets, and showing sometimes a tendency to form transverse series (usually, however, not well marked); inferomarginal spines two to four in a transverse series, the consecutive combs closely placed.

g^1. Inferomarginal spines bearing crossed pedicellariæ; abactinal spinelets surrounded by a circlet of crossed pedicellariæ.

h^1. Papulæ compound, each subdivided terminally into upward of eight small papillæ; inferomarginals diplacanthid, superomarginals monacanthid; adambulacrals diplacanthid; not fissiparous; gonads opening just above superomarginals abactinally in interbrachial angle; large unguiculate straight pedicellariæ. Type, *Aphanasterias pycnopodia*, sp. n.† [gen. nov. *Aphanasterias*,

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* *Smilasterias scalprifera* has a very inconspicuous series of actinals, while *S. tiremis* lacks them. The other three genera, so far as known, have no vestige of actinals.

† *Aphanasterias pycnopodia*, gen. et sp. n. Rays 5. Resembling a 5-rayed large *Stephanasterias* in general habit, but differing as detailed above. R=76 mm.; r=7 mm., R=10·8r; breadth of ray at base 9 or 10 mm.; disk very small, rays slender, tapering; marginal plates on ventrolateral margin; tube-feet very crowded, sometimes five or six across the furrow; actinostome small, sunken; adoral carina well developed; abactinal spinelets conical, one to a plate, 0·5 to 0·6 mm. long, not close; carinals in regular series; superomarginal spinelets forming one, inferomarginals two, and adambulacrals two regular longiseries; large unguiculate straight pedicellariæ; crossed pedicellariæ in small circles around

h^2. Papulæ simple, undivided; inferomarginals with three or four spinelets in a transverse comb; superomarginals with several spinelets in a comb; adambulacrals triplacanthid, at least in part; strongly fissiparous, rays upward of eight; gonads opening between supero- and inferomarginal plates, low on side of ray, in the axillary channel; large bivalved, dentate, straight pedicellariæ. Type, *Asteracanthion albulus*, Stimpson ..... [Verrill. *Stephanasterias*,

h^3. Papulæ simple, rays 5, not fissiparous; gonads opening just above superomarginals at a distance from interbrachial angle; adambulacrals diplacanthid; inferomarginals and superomarginals with transverse comb of three or four spines each; straight pedicellariæ small, compressed, lanceolate. Type, *Asterias japonica*, Bell ..... [gen. nov. *Aphelasterias*,

g^2. Inferomarginal spines chisel-shaped, entirely without pedicellariæ; abactinal crossed pedicellariæ isolated, not in circlets around the spinelets. Type, *A. scalprifera*, Sladen ..... [Sladen. *Smilasterias*,

f^2. Actinal plates in one to three series; not fissiparous; eggs and young not brooded by adult.

g^1. Plates small, with numerous small granuliform spinelets; abactinal skeleton close-knit, with small papular areas in the equivalent of four to six dorsolateral series (usually irregularly distributed); carinal plates regular; superomarginals small and with numerous small granuliform spinelets; equivalent of two or three series of actinal plates; adambulacral plates proximally diplacanthid and triplacanthid. Type, *Asterias rosea*, Müller (*Stichaster*, auct.) ..... [Verrill. *Stichastrella*,

g^2. Plates large, with few coarse

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the abactinal and superomarginal spinelets, and in tufts on the inferomarginals; papulæ giving the abactinal and intermarginal areas a papillose appearance. 48 fathoms, off Shumagin Islands, Alaska.

(often very large), capitate, globose spines and tubercles; abactinal skeleton with large, more or less irregular meshes, in two dorsolateral series on either side of the irregular carinal series; superomarginals with 1 to 3 spines; 1 to 3 series of actinal plates—usually 2 or 3; 1 well-defined though sometimes irregular series of dorsolateral plates; adambulacrals very regularly diplacanthid. Type, *U. globifera*, Gray = *A. granifera*, Lam. (see sect. 3, a^1, b^1, c^3, d^2, e^2, and footnote) ..... *Uniophora*, Gray.

f^3. Actinal plates in one or two series; not fissiparous; gonads opening ventrally; young brooded by adult; marginal plates clearly distinguishable, very regular, marked by differentiated spines; abactinal spines mostly isolated, irregular, surrounded by a collar of crossed pedicellariæ; superomarginals usually monacanthid, inferomarginals monacanthid or diplacanthid; actinals monacanthid; adambulacrals regularly diplacanthid; three or four pairs of contiguous postoral adambulacral plates. Type, *Diplasterias lütkeni*, Perrier = *Asterias brandti*, Bell ..... [Perrier. *Podasterias*,

e^2. Either the superomarginal plates or those of both series not easily distinguishable.

f^1. Only the inferomarginals of the two series clearly distinguishable; to them are joined small lateral transverse arcs (containing the superomarginals), separated consecutively by broad papular areas or skeletal spaces; abactinal skeleton an irregular network of plates, without indication of a carinal series; abactinal and inferomarginal spinelets slender, cylindrical, in small groups; two long adambulacral spines; ambulacral furrows wide, with large four-ranked tube-feet; rays 9 or 10, fissiparous. Type, *S. brachiata*, Koehler ..... [Koehler. *Saliasterias*,

f^2. Marginal plates not superficially distinguishable; a close granulation more or less uniform, without serial arrangement, interspersed with scattered pedicellariæ, overlies

relatively large 3- to 5-lobed plates in an irregular abactinal reticulum; marginals 4-lobed; an incomplete series of actinals; size small; gonads opening ventrally. (Includes *Hemiasterias*, Verrill, type *G. biseriatus*, Koehler.) Type, *Stichaster nutrix*, Studer ..... *Granaster*, Perrier.

d^2. Abactinal skeleton weak or else abortive; abactinal integument thick, papillose; no actinal plates.

e^1. Marginal and actinal plates present; marginal plates well developed; the superomarginals with one spine wreathed with pedicellariæ and having long descending processes which form a broad, vertical, intermarginal channel; inferomarginals with two webbed spines (each with a cluster of pedicellariæ on outer face); abactinal surface soft, rather irregularly and finely papillose; abactinal plates thin (with rudimentary spinelets only), forming an irregular reticulum entirely concealed by the skin; interbrachial septum strongly calcified; gonads opening ventrally, eggs huge; good-sized, broadly lanceolate, straight pedicellariæ on furrow-margin; two pairs of postoral adambulacral plates contiguous; adambulacral plates regularly diplacanthid. Type, *Diplasterias turqueti*, Koehler ..... [Verrill. *Cryptasterias*

e^2. Neither marginal nor abactinal plates present, the skeleton reduced to the ambulacral and adambulacral systems (see sect. 5) ..... [Verrill. *Adelasterias*,

b^2. Adambulacral plates monacanthid.

c^1. Actinal (ventrolateral) area broad, with two to four longiseries of conspicuous spiny actinal plates; actinostome very sunken; adoral carina narrow and long; gonads opening dorsally; carinal plates evident; dorsolateral skeleton robust, irregular, with stout spines; in addition to large unguiculate straight pedicellariæ, a peculiar small straight variety, having on each jaw a short, sharp and a long, truncate, laminate prong; among the adambulacral spines are clusters of straight pedicellariæ on long peduncles arising from the plates. Type, *Asterias ochracea*, Brandt ..... *Pisaster*, M. & T.

c^2. Actinal area not prominent; actinal plates in one series or wanting; no peculiar straight pedicellariæ with bifid jaws, as in

c^1; abactinal skeleton more or less well developed, consisting of lobed and oblong plates united into rather close meshwork, the carinal series being distinguishable; adoral carina composed of three to five pairs of united adambulacral plates.

d^1. Integument not thick nor covered with compound "cauliflower" pustules enclosing spines and completely hiding the skeleton.

e^1. Dorsolaterals numerous, forming an irregular network, in which not very regular longitudinal series can sometimes be distinguished; superomarginals not relatively very broad; inferomarginal plates and spines not forming a sharp ventrolateral border to ray.

f^1. Crossed pedicellariæ in circlets surrounding the abactinal and marginal spines; gonads opening ventrally; a series of actinal plates, usually spiniferous (absent in young specimens). (Including *Parastichaster*, Koehler*.) Type, *Asterias rugispina*, Stimpson ..... [Perrier. *Sporasterias*,

f^2. Crossed pedicellariæ scattered, not in circlets around spines; gonads opening dorsally. Plates robust; marginals and carinals four-lobed; dorsolaterals both three- and four-lobed, in three series; papular areas small, in about three dorsolateral and one intermarginal series on each side; no actinal papulæ; spines short, cylindrical, blunt, mostly one to a plate; inferomarginal spines large, usually two to a plate (often only one); adoral carina composed of five pairs of contiguous adambulacrals; actinostome small and sunken; a few fairly large, spatulate, denticulate, straight pedicellariæ. Type, *Hydrasterias verrilli*, Fisher ..... [gen. nov. *Tarsastrocles*,

e^2. Dorsolateral plates three-lobed, in one or two subregular series, more or less concealed by integument; superomarginals very broad; inferomarginals each bearing an oblique comb of two to four prominent spines, form a sharp ventrolateral border to ray; an inconspicuous series of actinal plates;

* See Fisher, Ann. & Mag. Nat. Hist., Dec. 1922, p. 596.

gonads open ventrally. Type, *C. asterinoides*, Perrier ..... [Perrier *. *Calvasterias*,

d^2. The thick dermis is raised into conspicuous "cauliflower" pustules which enclose spines and entirely obscure the skeleton; abactinal skeleton an irregular but complete reticulum of small imbricated, mostly simple elliptical to oblong, occasionally faintly lobed plates; carinal series very irregular; superomarginals monacanthid; inferomarginals mostly diplacanthid; the spines surrounded by mammilated sheaths which contain (like those of dorsal surface) a few fair-sized crossed pedicellariæ without enlarged terminal teeth; proximal adambulacrals occasionally diplacanthid; numerous scattered, narrowly spatulate to compressed, broadly lanceolate, often pedunculate straight pedicellariæ; tube-feet crowded, large, quadriserial; gonads open ventrally, although attached on level with marginal plates; adoral carina composed of four pairs of contiguous adambulacral plates. Type, *Anasterias octoradiata*, Koehler ..... [Fisher †. *Koehleraster*,

e^3. Marginal and abactinal skeleton much reduced, consisting of lateral, spaced, transverse tongues of plates (composed of two reduced marginals, with sometimes one or several abactinals) joined to the adambulacrals; dorsal surface with much reduced, disconnected, scattered abactinal plates. See section 5 for further details ..... *Lysasterias*, Fisher.

5. Abactinal surface devoid of a connected skeleton, soft and flexible, the abactinal plates, if present, isolated, spaced, and generally superficially invisible.

a^1. Both series of marginal plates present; adambulacral plates monacanthid.

b^1. Rays upward of 24, always more than 6, even in young; plates of both marginal series imbricating directly; alternate superomarginals spineless; inferomarginals diplacanthid, each spine with a sheath and bouquet of pedicellariæ; abactinal spines surrounded by a cushion of crossed pedicellariæ and attached to isolated subcircular plates; lateral,

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* Includes *Stichorella*, Koehler, type *Stichaster suteri*, de Loriol. The known species are:—*C. asterinoides*, Perrier, *C. lævigata* (Hutton)= *Stichaster suteri*, var. *lævigatus*, Hutton, *C. suteri* (de Loriol), *C. stolidota*, Sladen, *C. antipodum*, Bell. See *antea*, sect. 3.

† Ann. & Mag. Nat. Hist., Dec. 1922, p. 593.

oblique, transverse bands of small plates widely spaced on proximal part of ray; adambulacral plates with pedunculate bouquets of pedicellariæ; gonads opening abactinally. Type, *Asterias helianthoides*, Brandt ..... [Stimpson. *Pycnopodia*,

b^2. Rays 5; beyond base of ray, at least, plates of both marginal series not joined directly in series, but sometimes by a line of vestigial plates, in the case of the superomarginals.

c^1. Abactinal and marginal spines with a conspicuous tough sheath expanded at summit and bearing numerous small crossed pedicellariæ (of which each jaw has a conspicuously enlarged terminal tooth on one side and very numerous shank-teeth); superomarginals rather well spaced (alternates spineless), but connected by a line of vestigial plates; inferomarginals diplacanthid, the two spines immersed in a single tough sheath, widely expanded terminally; abactinal integument thin; plates widely spaced, interspersed with numerous vestigial microscopic platelets; adambulacral plates with isolated pedicellariæ; mouth-plates broad, with only one pair of contiguous, enlarged, postoral adambulacral plates; gonads opening abactinally. Type, *L. anthosticta*, Fisher ..... [Fisher *. *Lysastrosoma*,

c^2. Marginal and abactinal skeleton much reduced, consisting of lateral, spaced, transverse series or tongues of plates (composed of two reduced marginals plus sometimes one or several abactinals) abutting on the adambulacral plates; dorsal surface with much reduced, disconnected, scattered platelets; dermis thick, surrounding the spinelets in mammillated pustules; gonads opening ventrally. (Includes *Anasterias*, auct., nec Perrier; *Asteroderma*, Perrier; *Pedasterias*, Verrill.) Type, *Anasterias perrieri*, Studer ..... [Fisher †. *Lysasterias*,

a^2. Neither marginal nor abactinal plates present, the skeleton reduced to the ambulacral and adambulacral systems; body covered with numerous papillæ, containing each a slender spinelet, disposed without order on all surfaces; adambulacrals diplacanthid. Type, *Diplasterias papillosa*, Koehler..... [Verrill. *Adelasterias*,

Pacific Grove, California.

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* Ann. & Mag. Nat. Hist., Dec. 1922, p. 590.
† *Ibid.* p. 592.

LXIII.—*Note on the Roe-Deer of Kurdistan.*

By R. E. Cheesman and Martin A. C. Hinton.

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Some time ago the Museum received from the Bombay Natural History Society three or four mammals which Capt. L. V. Fitzpatrick had collected in Kurdistan. Among these were two skins of roe-deer—a male, with one of the antlers, half developed and in velvet, still attached, and a female. Although no collecting dates are given upon the labels, the skins are obviously winter skins, while the condition of the antler suggests a date between December and February. Recently Major F. S. Greenhouse obtained one left and three right antlers, belonging apparently to four individuals, in Kermandschah, Persia. These have been sawn off the skulls by the native hunters; one of them is a second antler, another is a fully developed antler of the third or a later pair, while the remaining two (including the left antler) seem to have belonged to still older individuals. A study of these materials shows that the Persian roe is in all essential respects more closely related to the European roe, *C. capreolus*, than it is to either *pygargus* or *bedfordi*, the two species respectively inhabiting Central and North-eastern Asia. But it is sharply distinguished from all species hitherto known by its peculiar pale grey coloration, and it may therefore be given distinct specific rank. It is just possible, however, that further material will show that this form intergrades with the markedly different *C. c. armenius* in the country to the north. We have great pleasure in associating with this interesting animal the name of Major-General Sir Percy Z. Cox, G.C.M.G., G.C.I.E., K.C.S.I., who has done so much to promote zoological research in Persia and Iraq.

Capreolus coxi, sp. n.

Size and essential characters, including the antlers, as in *C. capreolus*, but differing from all known members of the genus by its cold pale grey coloration in winter. Summer pelage unknown.

General colour of upper parts pale grey, very slightly darker than the "smoke-grey" of Ridgway; back noticeably darkened along the spine, from the nape to the rump, by the blackish subterminal bands of the hairs; colour clearing to "smoke-grey" on the flanks and the neck. The underparts, together with the inner surfaces of the limbs and the anal disc, white.

The velvet of the antler is unusually long and dense, pale brownish grey in colour. Antlers not differing in form or size from those of *capreolus*.

Type. A male skin in winter pelage, with an antler (perfected up to the first prong) in velvet attached. B.M. no. 21. 7. 17. 4. Collected at Zakho, Kurdistan, by Capt. L. V. Fitzpatrick. Presented by the Bombay Natural History Society.

Hab. Kermandschah district of Kurdistan, N.W. Persia.

No roe-deer has hitherto been known to occur so far to the south-east as Kurdistan, the nearest geographical allies of the new species being Blackler's *C. c. armenius* from the mountains south of Trebizond, and a race of normal dark colour, according to Satunin closely related to, or perhaps identical with, *armenius*, and inhabiting the well-wooded Talysch and Mazandaran districts along the south-western and western shores of the Caspian. Major Greenhouse, in lending us the antlers in his possession, informed us that "both came from the tribal district of Jowan-Rud, situated about 40 miles north of Kermanshah, N.W. Persia. The district consists of broken foothills close under the Avroman Mountains, of which the height is about 3000 to 4000 feet. The country is uninhabited, except for nomad tribes grazing their flocks during the annual migration, and is typical upland down-country, thinly wooded with dwarfed oak, hawthorn, and scrub, and usually covered with grass. The name in the local dialect signifies the 'Foolish,' because when it is hunted by mounted men it loses its head, runs in circles, and is easily killed. It is becoming very rare." Akbar Mirza, a noted Persian sportsman, informed Major Greenhouse that he had killed roe-deer in Mazandaran, near the Caspian, and he was convinced that, with the exception of Jowan-Rud, they did not exist elsewhere. Major Greenhouse adds that early in 1922 "a roe-deer was shot near Jowan-Rud and brought in to me in the flesh. It was about three years old, and the horns were in velvet."

Major Greenhouse's description of Jowan-Rud applies also to the Zakho district of Kurdistan, and no doubt this new roe-deer will be found in the uninhabited valleys and on the hill-sides throughout the range once known as the Zagros Mountains.

Both the pallid colour and the unusual length and density of the velvet in *C. coxi* are to be regarded probably as specializations correlated with the extreme climate of Kurdistan and the absence or poorness of the cover afforded by the vegetation in that country.

LXIV.—*New Myrmecophilous Gamasids.*

By the Rev. J. E. Hull, M.A.

The six species set forth below—five from West Australia and one from Persia—were sent to me by Mr. W. C. Crawley. They belong to the usual groups of myrmecophilous Gamasidæ, but one of them seems to require a new genus for its reception. It belongs to the Lælaptine section, in which the tarsal claws are absent or very much reduced. The single mounted specimen before me does not show the details of the mandibles.

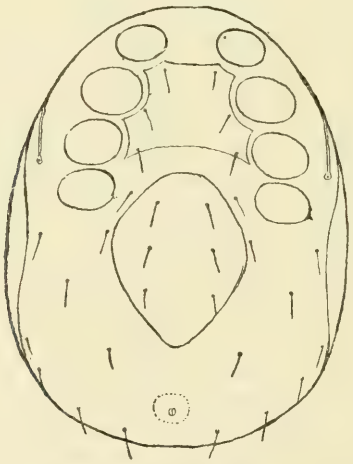
Hypoaspis australis, sp. n. (Fig. 1, ♀, ventral side.)

♀. Length 510 μ; width 370 μ.

Form broad-oval, shoulders nearly obsolete.

Dorsal scutum overlapping the venter a little just behind the fourth pair of legs; sparsely covered with stiffish hairs, their length about equal to the diameter of coxa iii.

Fig. 1.



Hypoaspis australis, sp. n., ♀.

The line joining the posterior margins of coxæ iv divides the venter exactly in half. Sternal scutum reaching beyond the middle of coxæ iii, and bearing three pairs of setæ. Genital scutum nearly diamond-shaped, widest just before the middle, smooth, with three pairs of setæ. Anal scutum not distinguishable because of damage. Rest of the ventral

surface smooth, with nine or ten setæ on each side; no lateral scutella visible.

Stigma between coxa iii and coxæ iv; peritreme slender, reaching the margin opposite the second pair of legs.

Legs rather long, all similar; the third joint with a false articulation near the base, the tarsus with two false articulations. Basal joint of palps as thick as femur i.

With *Camponotus chalceus*, Crawley, W. Australia.

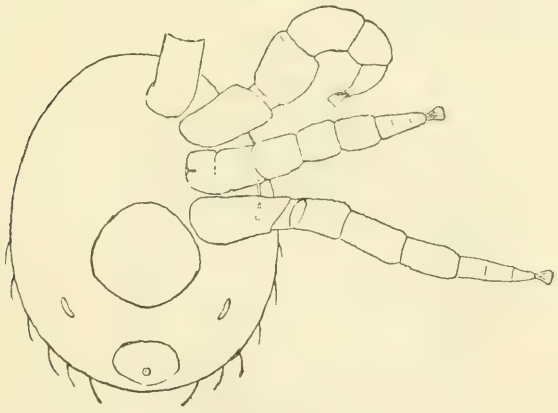
Two females, mounted in balsam, submitted to me by Mr. W. C. Crawley. Neither of them shows the structural details very clearly.

Myrmonyssus scutellatus, sp. n.
(Fig. 2, ♀, ventral view.)

♀. Length 720 μ; width 560 μ.

Ovate. Dorsal scutum covering the whole of the dorsum; uniformly setate, setæ of the margin as long as the diameter of tibia iv. First and fourth pairs of legs as long as the

Fig. 2.



Myrmonyssus scutellatus, sp. n., ♀.

body; all the legs rather thick, and all the joints abruptly narrowed at the apex.

Genital scutum subcircular, fore margin not extending in front of coxæ iv; a pair of narrow oblong scutella opposite the hinder margin. Anal scutum half the length of genital; rounded trapezoid, narrowed behind, where it reaches the posterior margin of venter.

Stigma behind the middle of coxa iv; peritreme running

straight forward to the margin, which it reaches opposite coxa ii, lying on a narrow peritremal scutellum.

With *Iridomyrmex innocens*, Forel, W. Australia.

Differs from typical *Myrmonyssus* in possessing lateral scutella on the venter, and a dorsal scutum which covers the whole dorsum.

Myrmeciphis, gen. nov.

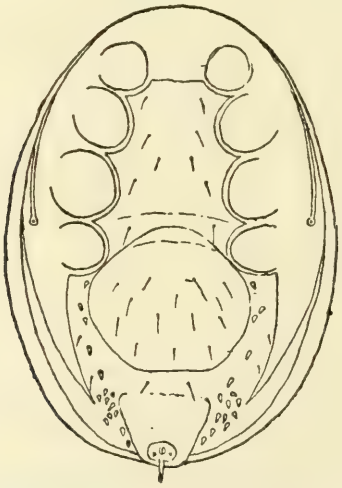
Tarsi without claws. Dorsal scutum extending laterally over the venter along the whole length of the body. Lateral scutum as in *Pachylælaps*, but distant more than its own width from the genital. Anal scutum large, its fore margin indistinct. Legs long, all similar; third joint with oblique false articulation; tarsi with two, not oblique.

Myrmeciphis crawleianus, sp. n.
(Fig. 3, ♀, ventral view.)

♀. Length 900 μ; width 600 μ.

Dorsum scabrid, uniformly hirsute, with rather scattered hairs. Body elliptical.

Fig. 3.



Myrmeciphis crawleianus, sp. n., ♀.

Genital scutum wider than long, rounded in front, truncate behind, with a few setæ. Anal scutum as wide in front as the posterior margin of the genital and not far removed from

it, narrowed behind, reaching the extreme margin of the body, where it bears a stout spine; a pair of very short stout spines flanking the anal orifice. On either side of the anal scutum an irregular series of stout blunt spines, about eleven in number, all but two before the middle. Three or four similar spines lie on either side of the genital scutum.

Legs with rather strong spines, which do not, however, exceed half the diameter of the joint on which they stand.

Stigma between coxæ iii and iv.

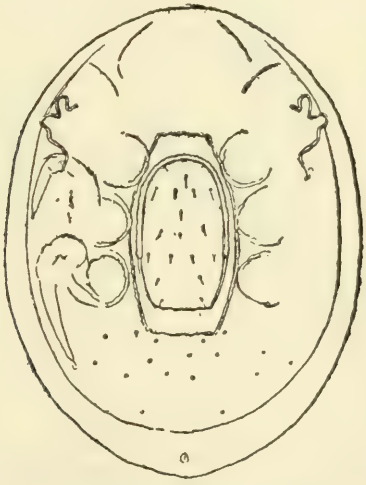
In nest of *Bothriomyrmex* sp., W. Australia.

Uroplitella inopina, sp. n. (Fig. 4, ♀, ventral view.)

♀. Length 510 μ; width 370 μ.

Broad-elliptical, clothed above and below like *Urodiscella ricasoliana*; otherwise resembling *Uroplitella pennsylvanica*, especially in the matter of the dorsal margin.

Fig. 4.



Uroplitella inopina, sp. n., ♀.

Margin of the sterno-genital scutum faintly crenulate, quite straight before and behind. The epigynal valve is of the usual general form, but considerably longer than in any other species of the genus, and extends just beyond the posterior margin of coxa iv. Like the rest of the ventral surface, it is sparsely hirsute.

The form of the peritreme is very characteristic. It

belongs to Berlese's "biplicate" group, but the posterior fold is double.

On the hairs and spurs of *Messor barbarus meridionalis*, Persia.

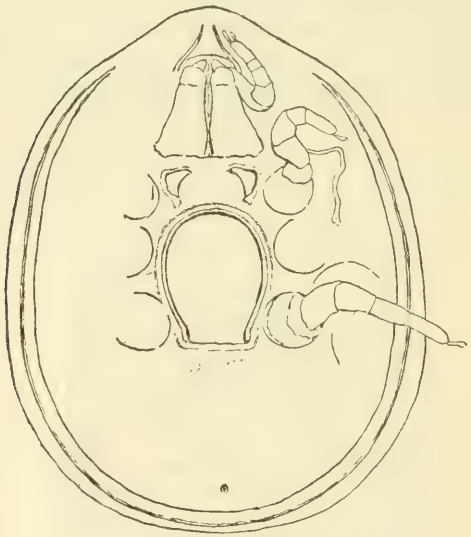
Janetiella auricularis, sp. n. (Fig. 5, ♀, ventral view.)

♀. Length 520 μ; width 380 μ.

Ovate, shoulders narrow but well marked.

Dorsal scutum continuous with the marginal in front, slightly raised within the margin. Central area a little elevated, piriform, narrowed in front, where it is limited by a

Fig. 5.



Janetiella auricularis, sp. n., ♀.

strongly chitinized margin; the surface is scabrid and sparingly setate, except on two smoother tracts, the anterior large, wider than broad, the posterior smaller, subcircular. A regular series of pretty strong setæ runs along the whole of the margin of the dorsal scutum, and a similar series marks the posterior limit of the central raised area, which is in this region otherwise ill-defined.

The epigynal valve is broad, oblong-elliptical, well rounded in front and truncate behind, broadest before the middle. The fore margin hardly attains to the line of coxæ ii, and the hind margin does not quite reach that of coxæ iv.

In the sternal region are two large, lateral, auriform foramina, adjacent to coxæ ii. The post-epigynal foramina—or, rather, pseudo-foramina—are very indistinct.

Peritreme in the form of a sickle.

On spurs of tibiæ of *Iridomyrmex gracilis*, Lowne, W. Australia.

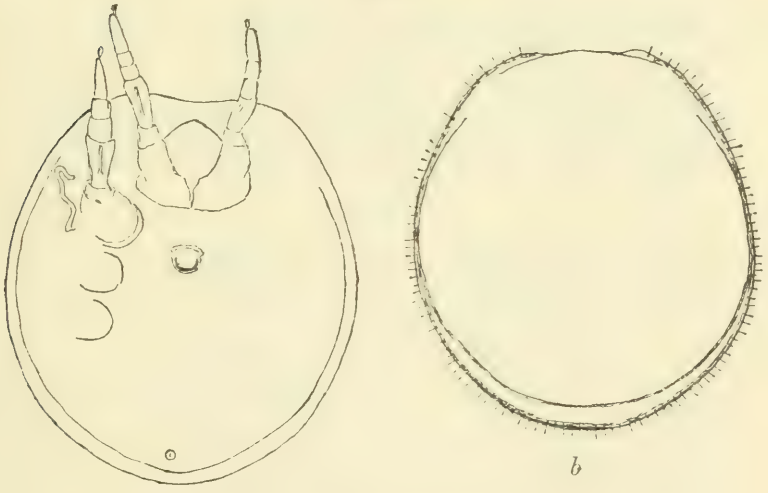
Urobovella cylliboides, sp. n.

(Fig. 6, ♂: *a*, ventral view; *b*, dorsal.)

♂. Length 770 μ; width 740 μ.

Subcircular, thus departing from the obovate form of the typical species, rather like *pandata*, Michael, which it also resembles in being entirely without the transverse preanal

Fig. 6.



Urobovella cylliboides, sp. n., ♂.

suture, so that the ventral scutum is quite continuous. The dorsal margin shows the usual shallow sinus in front.

Dorsum smooth, with a few striations diverging from the centre of the disk forward (one median fascia, two lateral curved outward). The narrow lateral scutum bears a continuous series of fine straight hairs, spreading radially.

Ventral scutum continuous—no pre-anal suture, no diagonal suture behind the fourth coxa (the *linea metapodica* of Berlese). The legs occupy a common lateral hollow—*i. e.*, there are no chitinized dividing ridges beyond the coxæ.

Peritreme simple, with the terminal (forward) flexure of the genus, but with a slight secondary flexure also.

The legs are fairly long, showing at least two joints beyond the margin when extended. The third joint (femur) has the usual longitudinal lamina below.

♀ and nymph unknown.

West Australia, with *Iridomyrmex* sp.

Addendum.

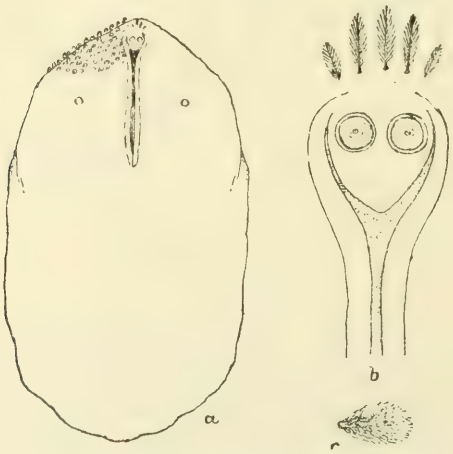
In addition to the above Gamasids found by Mr. Crawley clinging to ants supplied to him as specimens, it may be well to note here an *Acarus* found by him in the jaws of one of the ants. It is a Thrombidiid belonging to the tribe of the Rhyncholophinæ.

Achorolophus trucidatus, sp. n. (Fig. 7 : *a*, dorsum ; *b*, apex of crista ; *c*, dorsal seta.)

Length 1200 μ ; width 780 μ.

Thoracic portion of the dorsum roughly pentagonal, forming obtuse-angled shoulders just in front of the line of the eyes. There is, of course, no post-thoracic suture, so

Fig. 7.



Achorolophus trucidatus, sp. n.

that the base of the pentagon is an imaginary transverse line, which does not reach the side of the body, as an oblique lateral depression marks the junction of the two parts of the body.

The crista is of the usual form and extends pretty nearly the whole length of the cephalothorax, forked in front to enclose a rounded sensilligerous area, which is slightly domed and bears a pair of sensilli. In front of it stand five vertical setæ, much longer than wide, similar in form to those on the legs; the whole crista is surrounded by a slightly chitinized border.

Eyes single, situated opposite the middle of the crista, halfway between it and the lateral margin of the body.

The dorsal setæ are densely plumose, the whole outline being very broad-oval. They are rather closely set—about 95 to the linear millimetre. Length 12–15 μ. The setæ on the legs are considerably longer (about 25 μ), narrow-lanceolate, pinnately plumose, except those on the underside, which are naked or nearly so.

Tarsus i is narrowly elliptical, with strong simple hairs above and finer shorter hairs below, more densely set on a scabrid cuticle. Length of tarsus i 260 μ; width (or, rather, depth) 90 μ. The next joint is exactly the same length.

Taken from the jaws of *Crematogaster rufotestacea*, Mayr (from West Australia), and is, of course, not a Myrmecophile.

LXV.—*On* Odontobius ceti, *Roussel de Vauzème, a Nematode living on the Baleen of Whales.* By H. A. Baylis, M.A., D.Sc.

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Roussel de Vauzème described, in a series of communications to the 'Annales des Sciences naturelles,' a number of interesting observations on organisms living as parasites or commensals on Antarctic whales. Among these he gave an account (1834, *a*), under the name of *Odontobius ceti*, of a small Nematode to which considerable interest attaches owing to its unique habitat. It occurred in large numbers in a greyish-brown glutinous substance on the baleen-plates of a whale caught off the Falkland Islands.

Although several authors have since quoted Roussel's account of the worm, his description of it still seems to be the only one available, and the writer has failed to trace any subsequent record of the occurrence of the species. Roussel's account is mainly concerned with the mode of occurrence and habits of the worm, and, while his observations on living material are of great interest, his morphological description of the species is very brief.

The host, in the case of Roussel's material, was clearly the Southern right whale (*Balæna australis*), although he gives the determination of his whales incorrectly as *B. mysticetus**. His Excellency the Governor of the Falkland Islands has recently presented to the British Museum (Natural History) a quantity of material collected by Mr. A. G. Bennett at Deception Island, South Shetlands, in April 1923. This was obtained by scraping the baleen of two species of whales—the blue whale (*Balænoptera musculus*, L.) and the finner or common rorqual (*Balænoptera physalus*, L.). In each case, besides other organisms, there are large numbers of a nematode which, in spite of the difference of hosts, is in all probability *Odontobius ceti*. The determination rests more particularly upon the figure given by Roussel (1834, pl. ix. fig. 3 A), which evidently represents a female worm, and shows the spiral coiling of the slender posterior end which is very characteristic of the females among Mr. Bennett's specimens.

The following description is based upon material from *Balænoptera physalus* :—

Odontobius ceti, Roussel de Vauzème, 1834.

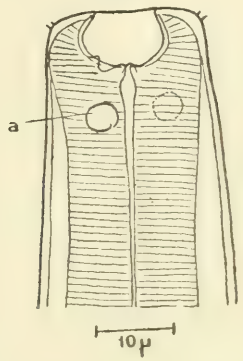
The body is elongated and slender, not tapering much anteriorly, but rather thicker in the œsophageal region than in the succeeding portion. The length varies between about 2·8 mm. and 4·75 mm. The maximum thickness, which in the male is at the level of the anus and in the female just in front of the vulva, is 0·04–0·06 mm. In the female the whole post-vulvar portion of the body is more slender than the pre-vulvar portion. The cuticular striations, if any, are exceedingly fine. There is a pair of lateral organs, or "amphids," situated a little behind the buccal cavity. These appear circular, but have a break in their contour, so that they are in reality very open spirals. The lateral fields apparently consist of a single row of cells with large nuclei. The anterior end is truncate. The diameter of the head is about 0·02 mm. Under a very high magnification two subdorsal and two subventral, exceedingly minute, cephalic bristles, or setiform papillæ, can be seen, and possibly there are others in a lateral position. These presumably represent the "pointes cornées" mentioned and figured by Roussel, though they are by no means so conspicuous as his figure indicates.

The mouth leads into a goblet-shaped buccal cavity which

* The writer is indebted to Sir S. F. Harmer, K.B.E., F.R.S., for the elucidation of this point.

is rather wider than deep, measuring about 0·007 × 0·012 mm. At the base of this cavity, at the entrance to the œsophagus, there are three blunt teeth. In addition to these, on what is

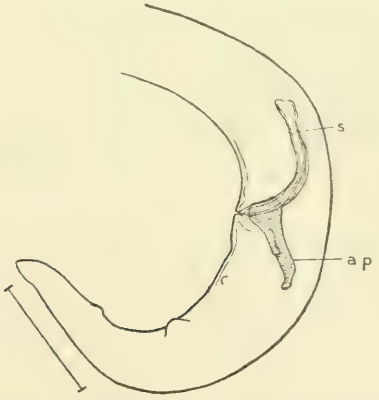
Fig. 1.



Odontobius ceti. Head of female; lateral view. *a.*, "amphid."

probably the dorsal side, there is another tooth situated in the wall of the cavity and projecting very little beyond it. The œsophagus is simple, without a bulb, but expanding

Fig. 2.



Odontobius ceti. Caudal end of male; lateral view.
a.p., accessory piece; *s.*, left spicule.
The scale represents 0·05 mm.

gradually posteriorly. Its length (measured from the extremity of the head) is 0·22–0·38 mm. The intestine is narrow immediately behind its junction with the œsophagus,

and then expands suddenly. The nerve-ring is situated at about the middle of the œsophagus. No excretory pore or gland has been made out.

In both sexes there is a small clear space at the tip of the tail, perhaps representing an adhesive organ or "spinneret." No definite caudal glands have been seen, but the caudal region contains more nuclei than any other part of the body, and some of these may belong to cells connected with the terminal organ already mentioned. The tail of the male, which measures 0·15–0·2 mm. in length, is curled ventrally and bears, apparently, three pairs of postanal papillæ, of which only the middle pair is large and conspicuous. There are two equal brownish spicules, which are flattened dorso-ventrally and have expanded proximal ends. They measure 0·06 mm. in length. A large and well-chitinized accessory piece embraces the distal ends of the spicules near the cloacal aperture, and is produced into a long and stout process passing obliquely backwards and dorsally. The greatest length of the accessory piece is about 0·036 mm. There is apparently a single testis, outstretched anteriorly.

The tail of the female is 0·25–0·38 mm. long. It is invariably curled dorsally, and usually forms a loose spiral coil. The vulva is situated very slightly behind the middle of the body (at 2·25 mm. from the posterior end in a specimen 4·75 mm. long), and leads directly into the uterus. The female genital apparatus is single, like that of the male, and lies entirely in front of the vulva. The terminal portion of the uterus, in mature females, contains from two to four large, unsegmented eggs, measuring about $0{\cdot}1 \times 0{\cdot}047$ mm. This portion of the uterus is separated from the rest of the genital tube by a modified region composed of large cells (probably glands). The ovary is long, running straight forward, and not reflexed.

The Genus Odontobius *and its Systematic Position.*

The general organization of the worm described above shows clearly that it belongs to the free-living group of Nematodes rather than to any of the strictly parasitic groups. It is, in fact, a free-living nematode that has taken to a semi-parasitic or commensal mode of life.

The general affinities of *Odontobius* were recognized by Nordmann (1840), Diesing (1851), Eberth (1863), Carus (1863), and Bastian (1865). Eberth gives a generic diagnosis (which is quoted by Bastian), but it is clear that this is based not on the genotype, *O. ceti*, which, apparently, he had not seen, but on certain other species described by

him and attributed to the genus. The presence, for example, of "two pairs of spicules, one large and one small" (*i. e.*, a pair of spicules and a pair of accessory pieces), mentioned in Eberth's diagnosis, indicates that these species are not congeneric with the form under discussion. However, in mentioning the presence of a buccal cavity armed with small teeth—a character omitted from the diagnosis, but given elsewhere,—Eberth (accidentally, as it seems, since the mouth-structure of *O. ceti* had never been described) gave the most important clue to the affinities of *Odontobius*. He places it correctly near to *Oncholaimus*, Duj. According to the excellent classification of the free-living Nematodes recently worked out by Micoletzky (1922), it seems clear that a form with the characters described above must fall into the subfamily Oncholaiminæ of the family Odontopharyngidæ. Several of the genera contained in this subfamily are exclusively, or almost exclusively, marine. Of these, *Odontobius* probably approaches most closely to *Oncholaimus*, in which both testis and ovary are occasionally single, and the accessory piece of the male, when present, is also single.

Remarks on the Biology of Odontobius.

The fauna and flora of the baleen plates of whales seem to provide a very interesting example of symbiotic association, though it is uncertain whether there is any real interdependence between the associated organisms. Roussel de Vauzème describes *Odontobius* as living in a layer of "tartar," a line in thickness, on the solid portions of the baleen-plates. This material, he says, is composed of an upper layer of white rounded "eggs," which are opaque and glistening, and contain "a substance which appears to be the unhatched embryo of a worm." Immediately below this layer he found another thicker layer, resembling brick-dust. Under a lens this was seen to be composed of "eggs" like the others, but brown, empty, and "showing a hole through which the worm has emerged." They were stuck to the baleen by means of a whitish cement, but easily separated. He remarks that at the beginning of winter in the Falklands the upper layer of white opaque "eggs" existed only in occasional spots, or not at all; while in summer, at the height of the whaling season (from October to January), the plates were covered with it.

In a further paper (1834, *b*) Roussel describes certain "vesicles" adhering by their bases to the horny tissue of the baleen, and hidden by the "oviform material." He says

that on removing the granular layer these objects are found projecting here and there, and compares their appearance to that of bottles standing on a table. These bodies he regards as "polyps" inhabiting bottle-shaped capsules, and names *Pirolina ceti*.

Woodcock and Lodge (1921) have described, under the name of *Hæmatophagus megapteræ*, a remarkable ciliate Protozoon from the baleen-plates of *Megaptera nodosa*. *Hæmatophagus* assumes a number of different shapes, including elongated sedentary forms inhabiting tubular envelopes, smaller vase-like forms, and ovoid resting forms of various sizes. It is interesting to note that among the type-material of *H. megapteræ*, now in the British Museum (Natural History), Nematodes occur which appear to be identical with those described above from *Balænoptera*, so that *Megaptera nodosa* is another host for *Odontobius ceti*.

The material from *Balænoptera* now described includes, besides the worms, diatoms of several kinds and numerous ciliate Protozoa, some of which Dr. Woodcock, who has kindly examined them, thinks probably identical with *Hæmatophagus megapteræ*. In addition to the more obvious ciliate forms, there are large numbers of ovoid bodies of various sizes, and these may be "resting stages" corresponding to those described by Woodcock and Lodge *. At first some of the smaller ovoid bodies, showing a distinct hyaline envelope, were taken to be the eggs of *Odontobius*, but on further examination this view had to be abandoned. The smallest of them are nearly twice the size of the eggs observed in the uterus of the female worms.

In view of all the above-mentioned facts, the writer is inclined to believe that the "polyps" of Roussel may have been Protozoa somewhat allied to *Hæmatophagus megapteræ* †, and that Roussel was mistaken in regarding the rounded bodies forming the "tartar" as the eggs of *Odontobius*. It seems more probable that they were "resting stages" belonging to the supposed protozoa.

The question arises, what becomes of the eggs laid by the females of *Odontobius*? Although the output of eggs by each individual female is evidently very small, the whole

* Tubular forms seem to be absent, and Dr. Woodcock thinks the forms found represent a later phase of the life-cycle of the animal.

† Dr. Woodcock thinks that the pyriform shape precludes the possibility that Roussel's "polyp" was identical with *Hæmatophagus*, but agrees that it may have been some kind of Stentorid in a gelatinous envelope.

colony must give rise to a very large number. Yet no eggs have been found free among the material. It seems possible, therefore, that the eggs are carried away by the stream of water passing between the baleen-plates, and that their further development takes place in the sea, the larvæ probably hatching there and depending upon chance for their passive introduction into the mouth of another whale.

As regards the food of *Odontobius*, Roussel supposes, with great probability, that the worms feed on minute particles of organic matter which the sifting action of the fringes of the baleen allows to escape. The worms, according to his account, remain with their coiled tails fixed in the layer of material covering the baleen, and stretch their anterior ends across the intervals between the plates. They may also, however, uncoil their tails and wander freely in the "tartar."

One of the most interesting statements made by Roussel is that *Odontobius* has the power of reviving when moistened after having been exposed for some time to the air. He says that if a baleen-plate which has been almost dried by four or five days' exposure be plunged again into sea-water, the worms revive and stretch out their heads again. If the baleen left ashore is wetted with rain, the same effect is produced. Unfortunately, these observations are not given in sufficient detail to show whether the "revived" worms were really alive, or whether they merely expanded and straightened out in water, as Nematodes commonly will, after having been reduced to a collapsed condition by drying.

References.

Bastian, H. C. 1865. "Monograph on the Anguillulidæ, &c." Trans. Linn. Soc. Lond. xxv. 2, pp. 73–184, pls. ix.–xiii.

Carus, J. V. 1863. [Worms, &c.] in Carus and Gerstaecker, Handbuch der Zoologie, Leipzig.

Diesing, K. M. 1851. Systema Helminthum, vol. ii.

Eberth, C. J. 1863. Untersuchungen über Nematoden, Leipzig.

Micoletzky, H. 1922. "Die freilebenden Erd-Nematoden, &c." Arch. f. Naturg. lxxxvii. Abth. A, 8–9 Heft. pp. 1–650.

Nordmann, A. von. 1840. "Les vers," in Lamarck, Hist. nat. des Anim. sans Vertèbres, Paris, 2 ed. vol. iii.

Roussel de Vauzème. 1834. (*a*) "Note sur l'*Odontobius ceti* de l'ordre des intestinaux cavitaires"; and (*b*) "Note sur des Polypes qu'on trouve sur les fanons des Baleines." Ann. Sci. Nat., Paris, (2) i. pp. 326–333, pl. ix.

Woodcock, H. M., and Lodge, Olive. 1921. "Protozoa, Part I.—Parasitic Protozoa." Brit. Antarctic ('Terra Nova') Exp. 1910, Nat. Hist. Report, Zoology, vi. 1, pp. 1–24, pls. i.–iii.

LXVI.—*Brief Descriptions of new Thysanoptera.*—XIII.

By Richard S. Bagnall, F.R.S.E., F.L.S.

This is continued from Ann. & Mag. Nat. Hist. ser. 9, vol. viii. pp. 393–400, and the following species are described:—

Dendrothripoides ipomeæ, gen. et sp. n.
Bregmatothrips ramakrishnæ, sp. n.
—— *saccharicola*, sp. n.
Frankliniella priesneri, sp. n.
Physothrips flavidulus, sp. n.
Hoplandrothrips flavipes, sp. n.
Neoheegeria zyziphi, sp. n.
Dactylothrips australis, gen. et sp. n.
Lamillothrips typicus, gen. et sp. n.
—— *pennicollis*, sp. n.

The new genera are all of interest, more especially *Dactylothrips*, discovered by Mr. Kelly, which exhibits so many previously undescribed features, though mostly of an ornamental rather than structural value. Kelly, who is rapidly opening up our knowledge of the Australian Thysanoptera, is to be congratulated on this capture, which, in the structure of the tube alone, helps to substantiate my contention as to the invalidity of Hood's family Pygothripidæ, chiefly based upon a departure from type in the form of the tube.

Two species of another genus (*Lamillothrips*) of the *Macrothrips* group (containing the giants of the order) are also worthy of special mention; they were part of an interesting collection made by Mr. W. H. Patterson in the Gold Coast, from which region I hope to obtain further material.

Suborder Terebrantia.

Family Thripidæ.

Genus Dendrothripoides, nov.

Surface of head and thorax roughly sculptured. Head transverse, constricted behind eyes and then roundly broadened. Antenna 8-jointed, style 2-jointed, long and slender. Mouth-cone reaching beyond the prosternum; maxillary palpi long, slender, 3-jointed. Pronotum without micro-setæ. Abdominal segment 10 long and stout, bristles of segments 9 and 10 long and spine-like. Wings very slender, apparently without veins or spines as in *Aneurothrips*.

This genus would appear to come near *Aneurothrips*, Karny, differing chiefly in the strong sculpturing of head and thorax, the form of the end of the abdomen and the strong bristles thereon, and in the long 3-jointed maxillary palpi, which in *Aneurothrips* are short and 2-jointed.

Type. *Dendrothripoides ipomeæ*, m.

Dendrothripoides ipomeæ, sp. n.

With the characters of the genus.

♀.—Length 0·85 to 0·9 mm.

General colour yellow, end of abdomen sometimes deeper, tinged with brown; fore-wing with a grey-brown patch near base starting on a line with end of scale, and another, occupying about 0·2 of the length of the wing, beginning at the second half; ciliæ fumate. Antennæ with style and distal half of joint 6 brown. Eyes black.

♂.—Length about 0·7 mm.

Tergite 9 with a strong elongated median tubercle supporting two stout spines contiguous at base, and at each side a fan-shaped scale-spine such as is seen in the ♂ of *Rhipiphorothrips*.

Hab. India, Maddur, Mysore, 30. viii. 1918 (Coll. Ramakrishna). Both sexes and larvæ plentiful on *Ipomea staphylina*. Reg. 336.

Bregmatothrips ramakrishnæ, sp. n.

♀ (macropterous).—Length about 1·7 mm.

Colour nearly uniform chestnut-brown, with thorax more yellowish-brown and abdominal segment 10 dark black-brown; legs brown, fore-tibiæ light yellow shaded with brown basally, tips of intermediate and, more narrowly, of hind-tibiæ yellowish, and all tarsi light yellow. Antennæ with intermediate joints 3–5 clear yellow and 2 yellowish distally.

Head about as long as broad near base, where it is broadest, and slightly longer than the prothorax; vertex swollen, produced anteriorly and broadly rounded; interocellar bristles long, anteocellar series longer than usual, about 0·5 the length of the interocellar; postocular series shortest.

Eyes about 0·42 the dorsal length of head, not so prominent as in the American species *venustus*, Hood, and *gracilis*, Hood and Williams, and the ocelli larger than in those species.

Antennæ at least 1·5 times the length of the head ; relative lengths of joints as follows :—15 : 26 : 32 (with stem) : 25 : 23 : 38 : 8 : 10. Sense-cones as in other members of the genus.

Prothorax about 1·2 times as broad as long, bristles at anterior angles slender, the inner one longer than the outer and from 0·3 to 0·35 the length of the prothorax. Mesothorax distinctly broader than the prothorax or metathorax, and with the metathorax (pterothorax) longer than broad. Wings long, lightly yellowish-fumate ; anterior vein of forewing with a series of 6–7 (3+3 or 4) basal setæ, and 2 at apex ; posterior vein with 9 to 10 setæ. All setæ pale, slender, and rather long.

Abdomen long and slender, with apex sharply conical ; segment 10 divided above, considerably shorter than 9 ; bristles on 9 and 10 long and strong, prominent.

♂ (macropterous).—Length about 1·2 mm.

Much as in the female, but with the end of the abdomen bluntly rounded. The posterior margin of tergite 9 is seemingly produced to form a pair of spine-set tubercles, one on each side of but at some little distance from the mid-line.

Hab. India, Palur, South Arcot ; several ♀ ♀ and 1 ♂ in leaf-tips of sugar-cane, 29. x. 18 (Coll. Ramakrishna). Reg. 338.

Bregmatothrips saccharicola, sp. n.

♀ (macropterous).—Length about 1·4 mm.

Described from a single mutilated example without antennæ and probably somewhat teneral.

Colour light brown, thorax with considerable hypodermal pigmentation ; segments 1 to 6 of abdomen yellow, probably more or less shaded with brown ; fore-legs pale lemon-yellow ; the only other leg present—a hind leg—is also yellow, with indications of light greyish shading.

Interocellar and anteocellar bristles not so strong as in *ramakrishnæ*, but with the postocular bristles well developed, being approximately as long as the width of the eye. The inner bristle of the pair at posterior angles of prothorax considerably longer than the outer and 3+7 setæ at base of anterior vein, then one at about basal third and 1+1 widely spaced distally ; posterior vein with 13 setæ.

Separated from *B. ramakrishnæ* by its smaller size, type of coloration, and chætotaxy. Further differences will no doubt be observed when more and better material becomes

available. Also separated from *B. dimorphus*, Priesner, by its pale legs and intermediate abdominal segments.

Hab. Africa, Khartoum, July 1910; on green sugar-cane (*King*).

Frankliniella priesneri, sp. n.

♀.—This species so closely resembles *F. pallida*, Uzel, that a detailed description is not desirable. It is only after the advantage of comparing examples with European specimens of *F. pallida* and the form *melanura* of Priesner (ex Coll. Priesner) that a description has become possible, as Uzel's descriptions omit details of chætotaxy etc. It is possible that the form *melanura*, Priesner, may prove to be of specific rank, differing not only in colour, but in length of the antennæ and points of chætotaxy. The discovery of the respective males will probably lead to interesting results.

F. priesneri agrees with *F. pallida* in colour, size, and form, but differs in the shorter and stouter antennæ, in the markedly shorter apical abdominal bristles, and the considerably longer postocular and inner antero-marginal prothoracic setæ.

The following table gives a comparison based on material before me :—

	pallida (1 ♀).	*melanura* (2 ♀ ♀).	*priesneri* (2 ♀ ♀).
Relative lengths of :—			
Antennal joint 2	11	12	11
„ „ 3	16·5	18	15
„ „ 4	14	17	14
„ „ 5	11·5	12·5	12
„ „ 6	15	17	14
„ „ 7	3	3	2·5
„ „ 8	4·5	5	3
Postocular seta	5	5	10
Prothoracic setæ :—			
a. Antero-marginal	10	10-12	16
b. Antero-angular	18	22-25	18
c. Outer postero-angular ..	21	27	18
Apical abdominal bristles :—			
a. Segment 9, outer	42	53	28
b. „ 10, „	40	47	30

Hab. Africa, Tunis, 26. ii. 1903 (Coll. Biro); 2 ♀ ♀. Previously labelled "*F. pallida.*"

Physothrips flavidulus, sp. n.

This species so closely resembles *P. flavidus*, Bagn., in every way, that a detailed description is unnecessary. The two basal antennal joints are colourless, whereas the second is yellowish or greyish-yellow in *flavidus*, whilst the antennæ are longer, the third and sixth antennal joint being noticeably longer than in *flavidus*. The following are the relative lengths of joints 3 to 8:—

3.	4.	5.	6.	7, 8.	
29 :	28 :	20 :	27 :	7	. . *flavidus.*
36 :	32 :	22 :	33 :	8	. . *flavidulus.*

♂.—Length c. 0·9 mm.

Tergite 9 with two pairs of setæ placed in a line near posterior margin, those of the inner pair being nearly twice as long as the outer; a third short pair are placed on a higher plane and are more widely distant than the outer pair of the posterior series and of about the same size.

Type. In Coll. Bagnall, University Museum, Oxford.

Hab. India, Dehra Dun, U.P., Jan.–Oct. 1921; 2 ♀ ♀ and 2 ♂ ♂ in flowers of *Eriobotrya japonica*. Near Bhowah Kumaona, on flower of *Clematis* sp., 5700 feet, Oct. 1902.

Frankliniella distinguenda, Bagnall, 1919.

Syn. 1921. *F. vernoniæ*, Priesner, Deutsche ent. Zeitschr. p. 190, fig. 2.

Frankliniella oxyura, Bagnall, 1919.

Syn. 1921. *F. minuta*, var. *paraguayensis*, Priesner, Deutsche ent. Zeitschr. p. 189, fig. 1.

Suborder Tubulifera.

Family **Phlœothripidæ.**

Hoplandrothrips flavipes, sp. n.

Closely related to the Nearctic and Neotropical species *uzeli*, Hinds, *xanthopus*, Hood, and *xanthopoides*, Bagnall. In the yellowish intermediate abdominal segments it agrees with *xanthopus*, and thus differs from *uzeli*, which has the abdomen quite uniformly yellowish-brown. The antenna is brown, with segment 3 dirty yellowish-brown, the basal third of 4 and 5 and the extreme base of 6 yellowish. It agrees with *uzeli* and differs from both *xanthopus* and *xanthopoides* in the broad third antennal joint, which in this species

is markedly broader than any other joint. The tube is 0·7 the length of the head and the terminal bristles are only slightly longer than the tube, very slender and pale distally.

A critical comparison of the four species will no doubt reveal other points of difference. The species will be more closely described later.

Hab. E. Africa; 1 ♀, Kijalie, a station on the Uganda railway, situated in the forest of the Kikuyu Escarpment (alt. 2100 m.), December 1911 (*Alluaud et Jeannel*).

Cephalothrips hispanicus, Bagn.

A male example from India can only be referred to this species, previously known from Spain.

Hab. India, Kulhara, Garhwal, 5. vii. 1910 (*A. D. Imms*); 1 ♂ from flower of *Rhododendron*, alt. 11,700 feet. Reg. 208.

Neoheegeria zyziphi, sp. n.

Length 1·8 to 2·0 mm.

Colour brown, fore-tibiæ shading to yellow distally, and tarsi yellow; intermediate and hind-tarsi light yellow-brown. Basal antennal joints 1 and 2 concolorous with head, rest yellow; 5 and 6 faintly tinged with grey to grey-brown apically; 7 similarly tinged, leaving only the base yellow; 8 wholly grey-brown. Wings clear, with cilia fumate.

Form much as in *fumipennis*, Bagnall; postocular and pronotal setæ shorter and stronger. Tube much shorter than in *fumipennis* and only 0·7 the length of the head. Antennal joints 3 and 4 obconical and broader than any of the following; relative length of joints 3 to 8 approximately as follows:—22 : 20 : 16 : 16 : 14 : 8.

Duplicated series of cilia in fore-wing 12 to 14.

Abdominal bristles long, dark, those on segment 9 longer than the tube.

Recognized by its shorter head and tube, colourless wings, and larger series of duplicated cilia in fore-wing.

Hab. India, Paresnoth, W. Bengal, 10. iv. 09; several examples on *Zyziphus rugosus* at 4400 feet. Reg. 186.

Genus Dactylothrips, nov.

Belonging to the Australian gall-thrips type with curiously shortened fore-tibia and massive armed tarsus.

Head longer than broad, slightly convergent posteriorly, with surface reticulation. Fore-ocellus pointed forwards. Antennæ apparently 7-jointed, 7 and 8 connate, with an

oblique dividing suture. Mouth-cone rounded. Fore-leg strongly incrassate, with very short tibia and a stout, strongly toothed tarsus. Wings moderately broad, parallel, without duplicated cilia.

Abdomen elongated, with curious dorsal sculpturings and elaborations. Segments 2 to 7 with a pair of latero-dorsal two-fingered processes carrying long inwardly directed setæ, and apparently taking the place of the usual wing-retaining spines; these processes are vestigial on segment 2, and reach their maximum development in 4 and 5. Between these, and chiefly discernible in 4 and 5, is what appears to be a plate exhibiting a curiously irregular tuberculate-serrate margin, but developing in 6 to 9 to very heavy embellishments or embossed sculpturings over almost the whole of each tergite. Segment 8 slightly produced laterally for the postero-angular setæ and 9 acutely angulate, the usual long spines being replaced by minute setæ. Tube short, abruptly broadened and sculptured basally and acutely angled at apex; hairs short and weak, encircled within the base of the tooth-like angle. Spines up to segment 8 long.

Type. *Dactylothrips australis*, m.

Dactylothrips australis, sp. n.

With the characters of the genus.

♀.—Length about 2·2 mm.

Colour golden-yellow to rich yellow-brown in the last abdominal segments. Pterothorax well marked with grey-brown to brown. Dark blackish-brown medium patch (representing base of plate-like ornamentation) on base of segments 3 to 7. Lateral margins and prolongations also dark.

Hab. Australia, Healesville, Victoria; one example only, from a dead wattle (*Acacia dealbata*), 17. 1. 14 (Coll. R. Kelly).

Genus Lamillothrips, nov.

Macrothrips–Machatothrips–Adiaphorothrips group.

♂.—Species large. Head longer than broad, cheeks spinose; postocular and interocellar bristles stout; antennæ elongated.

Pronotum about one-half as long as the head; *antero-lateral margins modified in the form of a raised wing-like plate.*

Fore-wings with duplicated cilia.
Tube long, about as long as the head.

Type. *Lamillothrips typicus*, m.

Lamillothrips typicus, sp. n.

♂.—About 5·0 mm.

Colour entirely deep blackish-brown. Head 1·6 times as long as broad across the eyes, which occupy about 0·2 the length of the head. Eyes closely facetted; ocelli large, the anterior one directed forward; interocellar setæ stout, and postocular pair long and strong, about 0·7 and 1·6 times the length of the eye respectively. Two genal spines near basal third, and one behind eyes longer and stouter than the others. Relative lengths of antennal joints 3 to 8 approximately as follows:—48 : 33 : 24 : 17 : 12 : 11.

Setæ of the pronotum developed, outer postero-marginal pair on slight tubercles. Outer margin of fore-femora with 4 or 5 short stout setæ set in tubercles, fore-tarsus with long strong tooth. Wings fumate, thickened brown median vein reaching to the second half; 40–44 duplicated cilia in fore-wing.

Hab. Aburi, Gold Coast, 17. xi. 15 (*W. H. Patterson*). With other species in tunnel of moth-borer of cocoa-stems. I. B. E. no. 110. 200.

Lamillothrips pennicollis, sp. n.

♂.—About 7·0 mm.

Colour dark blackish-brown.

A larger and heavier species than *typicus*.

The seta behind each posterior ocellus (vestigial in *typicus*) developed, about 0·5 the length of the eye. Postocular bristles twice as long as the eye, and a pair of mid-dorsal bristles nearly as long. Relative lengths of antennal joints 3 to 8 approximately as follows:—47 : 35 : 25 : 17 : 12 : 11.

Wing-like development of pronotum greater than in *typicus*, and outer postero-marginal seta set in a strong projection. Coxal spine set in an elongated tubercular projection. Fore-legs considerably enlarged; outer margin of femur in basal half set with 6 or 7 strong spines; tarsal tooth very long.

Fore-wings with 50–52 duplicated cilia.

Hab. Aburi, Gold Coast, with *L. typicus* and *Machatothrips* sp.

BIBLIOGRAPHICAL NOTICE.

The British Journal of Experimental Biology.

The application of the experimental method to purely biological problems has resulted within recent times in a considerable advance towards the solution of these problems, and contributed in no small measure to the progress of the applied biological sciences. Such work as has been carried out in this country has been published in one or other of the various journals devoted to biological subjects, for up to the present no journal has been devoted to experimental work alone. In order to make up for this deficiency in our scientific literature, and provide a medium for the publication of work on experimental biology, a number of well-known investigators in this field of research have collaborated to found 'The British Journal of Experimental Biology,' the managing editor of which is Dr. F. A. E. Crew, Director of the Animal Breeding Research Department of Edinburgh University. The range of subjects in the first number —now before us—is an indication of its wide scope. Drs. L. T. Hogben and F. A. E. Crew contribute a paper on "Endocrine Activity in Fœtal and Embryonic Life"; Mr. C. M. Yonge has a paper on the Comparative Physiology of Digestion, the Lamellibranch *Mya* being the subject of this, the first of a series of studies; "Parthenogenesis in the Mollusc *Paludestrina jenkinsi*" is described by Mr. G. C. Robson, while Professor J. S. Huxley contributes a cytological paper on linkage in *Gammarus chevreuxi*, and Miss H. B. Fell describes the histological basis of sex-reversal in the fowl. In addition to these valuable papers containing accounts of original work, a most useful feature of this first number is a critical summary of the work which has been carried out with tissue-cultures; this has been written by Mr. H. M. Carleton.

The journal is well printed, and the illustrations on the whole are good, although we consider that more of the histological illustrations could, with advantage to their clarity, have been carefully drawn, instead of photographed, as cytological details can rarely, if ever, be adequately represented in a photomicrograph. However, we congratulate the editors on this first number of their new journal, which will, no doubt, come to occupy an important place in scientific literature, and should help to stimulate our younger researchers to investigate the numerous problems which can only be attacked by the methods of experimental biology. R. J. Ludford.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 72. DECEMBER 1923.

LXVII. — *Notes on African Non-marine Mollusca, with Descriptions of many new Species* (cont.). By M. Connolly.

[Plate XIX.]

Subfamily *Stenogyrinæ* (cont.).

The next four genera are founded on somewhat artificial conchological grounds, whose limits it is extremely difficult to define. While *Pseudopeas* is, normally, easily determinable by the spiral sculpture of its apical whorls, a feature absent from the other three genera, this sculpture is sometimes so faint that it can only be imagined under a magnification of over a hundred. *Curvella*, normally distinguishable through its short obese shell and strongly-arched profile of the outer lip, as well as its large eggs, few in number, is frequently so attenuate that it might easily be an *Opeas*, while eggs are no guide, if not present within the shell. *Opeas* and *Euonyma*, slender forms without columellar truncation, are merely divided by a length-line, roughly less or greater, respectively, than 14 mm. *Euonyma*, in particular, is an unsatisfactory genus as at present constituted, but more extended knowledge of the anatomy is necessary before any of the group can be stabilised.

Genus Euonyma, M. & P. (cont. from (9) xi. p. 357).

Stenogyroid shells of fair size, usually exceeding 14 mm. in length, differing from *Subulina* in being perforate, or devoid of columellar truncation.

Euonyma terebræformis, sp. n. (Pl. XIX. fig. 37.)

Shell of fair size, elongate-turriform, rimate, thin, silky, pale oblivaceous. Spire produced, sides regular, apex rounded. Whorls 11, not very convex, gradually and regularly increasing, the first $2\frac{1}{2}$ practically smooth, remainder sculptured all over with extremely fine and close, faint, regular, curved, very slightly oblique, transverse striæ, which are cut by equally close microscopic spiral lines; suture simple, well defined. Aperture suboval, peristome simple, acute, outer lip but little outcurved, slightly arched forward and receding a little further to the narrowly rounded base; columella erect, slightly concave, margin narrowly reflexed, nearly concealing the small rima.

Long. 23·5, lat. 6·0; apert., alt. 6·3, lat. 2·5; last whorl 9·8 mm.

Hab. Cape Province, Port St. Johns (*Warren*).

Type in British Museum.

A well-defined species, resembling in form a miniature *E. lanceolata* or *lymneæformis* rather than any of the *turriformis* group, than all of which it has longer whorls, while its spire is more slender, with straighter sides, than that of *sarissa*, Pilsbry.

Euonyma pareimena, sp. n. (Pl. XIX. fig. 53.)

Shell of fair size, elongate-turriform, rimate, thin, slightly silky, nearly transparent, pale olivaceous. Spire produced, apex convex-conoid. Whorls 8, regularly increasing, the first 2 closely microscopically punctate, the 3rd sculptured with faint, nearly straight, vertical striæ, and the remainder with stronger, close, fairly regular, rather strongly curved, vertical striæ, which are fainter on the lower part of each whorl; suture simple, well defined. Aperture semi-ovate, rather narrow at base, peristome simple, acute, outer lip moderately arched forward, columella straight, erect, margin narrowly reflexed, leaving a clear rima.

Long. 16·8, lat. 4·7; apert., alt. 4·25, lat. 1·8; last whorl 7·5 mm.

Hab. Kenya, Mau Escarpment (*Doherty*).

Type in British Museum.

The embryonic shell is ovate, rimate, and consists of 3

whorls, the last showing faint vertical striation and all extremely faintly, closely, microscopically spirally punctate. The spiral puncture is, however, so faint that, in spite of it and of the apex approaching in shape that of *Subuliniscus*, I am inclined to place the present species temporarily in *Eu nyma*, rather than to regard it as a perforate form of *Subuliniscus*.

The seven species which follow are remarkable for their very strong, close, regular, glossy, costulate sculpture, and I have little doubt but that all are descended from one original stock. Each, however, appears to have now established features of specific difference from any others of the group, and it would even be possible, on account of size of shell and curve of outer lip, to distribute them among the three so-called genera, *Opeas*, *Curvella*, and *Euonyma*, but, until more is known of the animals, it may be advisable to retain all together in one genus, which, owing to the considerable size of the larger members, should perhaps be the very elastic *Euonyma* :—

Euonyma fulgens, sp. n. (Pl. XIX. fig. 29.)

Shell of fair size, elongate-turriform, rimate, thin, silky, lustrous, pale olivaceous. Spire produced, apex rounded. Whorls 8, convex, slightly gradate, gradually increasing, the first 2 practically smooth, the 3rd showing faint transverse striæ, sloping backward from top to bottom, remainder covered all over with close, regular, slightly curved, vertical costulæ; suture simple, impressed. Aperture subrhombic, peristome simple, acute, outer lip moderately arched forward and receding slightly further to the base, columella erect, slightly tortuate, margin almost adnately reflexed, nearly concealing the rima.

Long. 18·2, lat. 6·0; apert., alt. 7·2, lat. 2·7 ; last whorl 10·5 mm.

Hab. Kenya, north slope of Mt. Marsabit, 4600 ft. (*Percival*).

A very fine species, with brilliant silky lustre.

Subsp. *nyiroensis*, nov. (Pl. XIX. fig. 30.)

Comparatively more obese than the typical form, with, possibly, very slightly shorter whorls. The largest example examined contains 7 whorls and measures :—

Long. 14·5, lat. 5·2 ; apert., alt. 5·8, lat. 2·5 ; last whorl 8 5 mm.

Hab. Kenya, Mt. Nyiro, S. of L. Rudolph, 8300 ft.

Euonyma percivali, sp. n. (Pl. XIX. fig. 17.)

An almost exact miniature of *E. fulgens*, with slightly less convex whorls. The transverse sculpture is very faint on the 2nd and stronger on the succeeding whorls, but somewhat weaker throughout than in *fulgens* ; the outer lip is well arched forward a short way below the suture ; the shell contains 7 whorls and measures :—

Long. 12·25, lat. 4·3 ; apert., alt. 4·5, lat. 2·1 ; last whorl 7·0 mm.

Hab. Kenya, between Eusso Nyiro and Mt. Marsabit (*Percival*).

Euonyma blayneyi, sp. n. (Pl. XIX. fig. 18.)

Shell comparatively small, elongate-turriform, rimate, thin, silky, pale olivaceous. Spire produced, sides regular, apex narrowly rounded. Whorls 7, convex, regularly increasing, the first smooth, remainder sculptured all over with close, strong, regular, nearly straight, vertical costulæ, which are weaker on the 2nd whorl ; suture simple, impressed. Aperture subovate, peristome simple, acute, outer lip nearly straight in profile, hardly receding to the base, columella slightly inclined to the right, bulging inwards near the upper extremity, margin rather strongly reflexed, half covering the rima.

Long. 13·0, lat. 4·2 ; apert., alt. 4·6, lat. 1·8 ; last whorl 7·1 mm.

Hab. Kenya, Larogi Hills (*Percival*).

The nearly straight profile of the outer lip prevents this species from being placed in *Curvella* and clearly separates it from *E. percivali*, which it otherwise closely resembles.

Euonyma arthuri, sp. n. (Pl. XIX. fig. 19.)

Shell comparatively small, turriform, rimate, thin, silky, glossy, pale olivaceous. Spire produced, sides regular, apex rounded. Whorls 7, convex, subgradate, regularly increasing, the first smooth, remainder sculptured all over with close, regular, nearly straight, vertical costulæ, faint on the 2nd whorl and thence increasing in strength ; suture simple, impressed. Aperture ovate, peristome simple, acute, outer lip nearly straight and vertical in profile, columella inclined inwards, margin strongly reflexed, forming a clear rima.

Long. 13·0, lat. 4·5 ; apert., alt. 5·0, lat. 2·1 ; last whorl 7·3 mm.

Hab. Kenya, Urquess (*Percival*).

A beautiful glossy shell, differing from the preceding species chiefly in its broader base and finer apex. The egg is very small, thus resembling that of *Opeas* and *Euonyma*, rather than *Curvella*.

Euonyma topazon, sp. n. (Pl. XIX. fig. 20.)

Shell small, subulate, imperforate in the type, thin, silky, glossy, olivaceous. Spire produced, apex mammillate. Whorls 6, moderately convex, rather rapidly increasing, the first smooth, 2nd nearly so, remainder sculptured all over with close, regular, rather broad, slightly curved, nearly vertical costulæ; suture simple, impressed. Aperture irregularly subovate, peristome simple, acute, outer lip very slightly bent inwards at the most advanced point of its slight forward curve; columella straight, slightly inclined inwards, margin extremely narrowly adnately reflexed in the type, but in most specimens forming a very small, but distinct, rima.

Long. 10·0, lat. 3·9; apert., alt. 3·8, lat. 1·75; last whorl 6·1 mm.

Hab. Kenya, Urquess (*Percival*).

Apart from its being almost imperforate, I fail to recognise this as the young of any of the foregoing species, to which, however, it must be nearly allied. If the type is fully mature, it will probably prove to be a *Curvella*, but for the present I prefer to place it temporarily in the highly sculptured group of Kenyan *Euonymæ*.

Subsp. *igembiensis*, nov.

Differs from type in being perforate, the columellar margin disclosing a clear, narrow umbilicus; the costulæ, also, appear to be a little finer and the outer lip is not incurved. The shell contains 6 slightly gradate whorls and measures :—

Long. 10·2, lat. 3·8; apert., alt. 4·2, lat. 1·75; last whorl 6·1 mm.

Hab. Kenya, Igembi Hills, 4000 ft. (*Percival*).

Euonyma pernitens, sp. n. (Pl. XIX. fig. 21.)

A broader form than *E. topazon*, with rather shorter whorls and stronger straighter sculpture, which is very faint on the 2nd whorl and prominent on the later ones. The outer lip is nearly straight in profile; columella straight and erect,

margin reflexed, forming a distinct rima. The shell contains 6 convex, slightly gradate, whorls and measures :—

Long. 9·8, lat. 4·2; apert., alt. 4·1, lat. 2·0; last whorl 6·25 mm.

Hab. Kenya, Chanler Falls, Eusso Nyiro (*Kemp*).

Euonyma eussoensis, sp. n. (Pl. XIX. fig. 22.)

A rather narrower form than *E. topazon*, with shorter, slightly more convex, whorls and finer sculpture, which, however, is considerably stronger on the 2nd whorl than in either *topazon* or *pernitens*. The outer lip advances but little ; the columella is straight and erect, margin moderately reflexed, forming a clear rima. The shell contains $7\frac{1}{2}$ whorls and measures :—

Long. 10·75, lat. 3·7 ; apert., alt. 3·8, lat. 1·5 ; last whorl 5·75 mm.

Hab. Kenya, Eusso Nyiro (*Kemp*).

Genus Curvella, Chaper, 1885.

Shells of rather obese contour, devoid of spiral sculpture on the apical whorls, with outer lip strongly curved forward in profile.

Curvella batesi, sp. n. (Pl. XIX. fig. 7.)

Shell small, conoid, subrimate, thin, smooth, glossy, transparent, pale olivaceous. Spire moderately produced, sides regular, apex narrowly rounded. Whorls 6, convex, rapidly increasing, the last rounded at the periphery, all but the apical sculptured with close, regular, transverse striæ, very faint, nearly straight, and sloping backwards on the second, stronger and sloping somewhat forward on the next 3, and more strongly curved below the suture on the last whorl ; suture simple, impressed. Aperture subovate, peristome simple, acute, outer lip moderately arched forward shortly below the suture and then receding a little more to the base ; columella straight, erect, margin narrowly reflexed towards the upper extremity, forming a small rima.

Long. 7·5, lat. 4·0; apert., alt. 3·0, lat. 1·7 ; last whorl 5·0 mm.

Hab. Camerun, Bitze (*Bates*).

Type in British Museum.

A very ordinary little *Curvella*, smaller than most of the West Coast species.

Curvella masakana, sp. n. (Pl. XIX. fig. 45.)

Shell comparatively large, claviform, umbilicate, thin, slightly silky, pale olivaceous. Spire moderately produced, apex acutely rounded. Whorls 6, rather flat, somewhat rapidly increasing, the first smooth, remainder sculptured with faint, close, regular, curved, vertical striæ; suture simple, well defined. Aperture subovate, peristome simple, acute; outer lip bulging outward towards the base, well curved forward in profile shortly below the suture; columella straight and long, margin strongly reflexed, half covering the umbilicus.

Long. 12·2, lat. 6·5; apert., alt. 5·5, lat. 2·9; last whorl 8·3 mm.

Hab. Uganda, Lake Mutanda (type); also between Mbarara, Masaka, and Kigezi (*Kemp*).

Rather a large species, which does not appear referable to any of its neighbours.

Curvella campyla, sp. n. (Pl. XIX. fig. 13.)

Shell of fair size, acuminate-ovate, imperforate, thin, smooth, glossy, transparent, pale olivaceous. Spire produced, apex subacute. Whorls 6, convex, rather rapidly increasing, the first 2 smoothly microscopically punctate, the next faintly vertically striate, 4th and 5th sculptured with moderately close, curved, oblique striæ, which gradually assume the character of incised grooves, becoming somewhat distant on the last whorl, on the front of which only 12 are visible; there is trace of close microscopic spiral striation on the later whorls; suture simple, well defined. Aperture subpiriform, peristome simple, acute; outer lip arched well forward, very slightly incurved at its foremost point, and receding an equal distance to the base; columella short, subtruncate at its base, which is halfway up the labium.

Long. 9·1, lat. 4·3; apert., alt. 4·4, lat. 1·7; last whorl 6·7 mm.

Hab. Uganda, between Mbarara and Masaka (*Kemp*).

Differs from *C. entebbeensis*, Prest., in its incised sculpture, which is twice as distant as in *C. langi*, Pilsb. The sculpture of *C. conoidea* (Mts.) is more uniformly incised throughout, while that species is widely umbilicate.

Curvella elgonensis, sp. n. (Pl. XIX. fig. 14.)

Shell of fair size, acuminate-ovate, rimate, thin, smooth, pale olivaceous. Spire moderately produced, apex acutely

rounded. Whorls $6\frac{1}{2}$, rather convex, somewhat rapidly increasing, the first $1\frac{1}{2}$ practically smooth, remainder sculptured with faint, rather irregular, nearly straight, vertical striæ; suture simple, well defined. Aperture subovate, peristome simple, acute; outer lip curved evenly outwards, strongly arched forward just below the suture and receding rather further to the base; columella slightly inclined inwards, margin extremely narrowly reflexed, forming a minute rima.

Long. 10·2, lat. 4·9; apert., alt. 4·2, lat. 2·2; last whorl 6·6 mm.

Hab. Uganda, Mt. Elgon (*Woodhouse*).

Var. *woodhousei*, nov. (Pl. XIX. fig. 15.)

A more slender form than the type, but apparently not otherwise separable; the shell contains 6 whorls and measures:—

Long. 9·4, lat. 4·1; apert., alt. 3·5, lat. 1·6; last whorl 6·0 mm.

Hab. Uganda, Mt. Elgon (*Woodhouse*).

Almost every individual in this species appears to differ slightly in sculpture, especially in the form and strength thereof on the apical whorls, but there is no constant formula by which they can be separated.

Curvella pertranslucens, Preston.

This species is rather widely distributed in the Kenya district, as since first discovered by Kemp in the Shimbi Hills it has been collected by him at Mweru, Mt. Kenangop, and the Eusso Nyiro, and by Percival at Urquess. There is a slight difference in form between individual shells, but the sculpture remains unchanged, and there appear to be no constant grounds for differentiation.

Subsp. *fallooni*, nov. (Pl. XIX. fig. 16.)

A rather more slender form than the type, containing $6\frac{1}{2}$ whorls and measuring:—

Long. 13·0, lat. 4·5; apert., alt. 5·0, lat. 2·0; last whorl 7·6 mm.

Hab. Kenya, Nairobi (*Falloon*); Igembi Hills, 4000 ft. (*Percival*); Darugu R. Valley (*Harries*).

This slender form appears to be quite constant in its own localities, but is hardly specifically separable from *C. pertranslucens*.

Curvella modesta, Conn., subsp. *compsotera*, nov.

Shell very small, elongate-ovate, rimate, thin, smooth, shining, transparent, pale olivaceous. Spire produced, sides regular, apex narrowly rounded. Whorls 6, rather flat, gradually increasing, the first 2 practically smooth, remainder sculptured with faint, close, regular, curved, vertical striæ and extremely close, faint, microscopic, spiral striation, which is only traceable in certain lights and is probably of no specific value; suture simple, shallow. Aperture subquadrate, peristome simple, acute; outer lip curved a little forward; columella straight, erect, margin rather narrowly reflexed, but almost concealing the small rima.

Long. 6·5, lat. 2·3; apert., alt. 2·0, lat. 1·1; last whorl 3·7 mm.

Hab. Natal, Osborn (type, *Pocock*). Cape Province, Cathcart (in British Museum, ex coll. Wotton).

Type in British Museum.

Very slightly more slender and graceful than the variable typical form, but apparently not otherwise separable.

Curvella inornata, Chaper, 1885. (Pl. XIX. fig. 8.)

I illustrate a paratype of this unfigured species, from Assinie.

Curvella quisqualis (M. & P.), 1892.

1892. *Buliminus quisqualis*, M. & P. Ann. & Mag. Nat. Hist. ix. p. 90, pl. v. fig. 10.

As it was described as a *Buliminus*, it may be as well to explain that this is a moderately slender *Curvella*, rather larger all over than *C. associata* (Smith) with longer whorls and less slender apex.

Genus Pseudopeas, Putzeys, 1899.

Stenogyroid shells differing from *Opeas* and *Curvella* through the apical whorls being *microscopically spirally striate*.

Group A. Shell comparatively large, somewhat resembling that of *Curvella*.

Pseudopeas guineense (Jonas), 1843.

1843. *Bulimus guineensis* Jonas, Phil., Abb. u. Beschr. i. p. 54, pl. i. fig. 4.

If specimens in the British Museum from Guinea (Mus.

Cuming) are properly identified, this species can only be placed at present in *Pseudopeas* ; the spiral sculpture on the apex is exceedingly strong, quite typical of this genus, and quite different from the distant incised spiral striation of *Neoglessula*, Pilsbry.

Pseudopeas imitans, sp. n. (Pl. XIX. fig. 6.)

Shell small, broadly subulate, narrowly umbilicate, silky, transparent, pale olivaceous. Spire moderately produced, sides regular, apex bluntly submammillate. Whorls 5, convex, rather rapidly increasing, the last very bluntly angulate at the periphery, the first 2 sculptured with close, regular, spiral striæ, which continue more faintly on the 3rd ; there are faint traces of transverse striæ on the 2nd whorl ; on the 3rd these become stronger, close, regular, vertical, and nearly straight, while on the last 2 they are considerably arched forward below the sutures, which are simple and deeply impressed ; aperture subovate, peristome simple, acute, outer lip moderately curved forward, base not receding ; columella straight and vertical, margin rather narrowly reflexed over the narrow umbilicus.

Long. 6·7, lat. 3·6; apert., alt. 2·75, lat. 1·5 ; last whorl 4·8 mm.

Hab. Tanganyika, Dar-es-salaam (*Connolly*).

A remarkable curvelliform *Pseudopeas*, but differing clearly in form from any *Curvella* known to me.

Pseudopeas tenue, sp. n. (Pl. XIX. fig. 5.)

Shell of moderate size, fusiform, rimate, thin, shining, transparent, pale olivaceous. Spire produced, sides slightly convex, apex narrowly rounded. Whorls 6, flattish, the last 2 increasing far more rapidly than the remainder, the first 2 covered with very faint and close, regular, microscopic, spiral striæ, remainder sculptured with weak, regular, curved, vertical striæ, on which the spiral sculpture is visible throughout ; suture simple, shallow. Aperture subovate, peristome simple, acute, outer lip well curved forward and receding equally to the base ; columella weak, rather concave, margin very narrowly reflexed, forming a minute rima.

Long. 7·5, lat. 2·5 ; apert., alt. 2·0, lat. 0·9 ; last whorl 4·2 mm.

Hab. Natal, Krantzkop (type) ; Zululand, Eshowe (*Burnup*).

Type in British Museum.

I place this species in *Pseudopeas* on account of its very

noticeable spiral sculpture, but its habit is that of a South African *Curvella* and its eggs, comparatively large and only two or three in number, also suggest affinity with the latter genus.

Pseudopeas concinnum, sp. n.

Shell small, acuminate-ovate, rimate, thin, silky, transparent, pale olivaceous. Spire somewhat produced, apex narrowly rounded. Whorls 6, rather flat, regularly increasing, the 2nd covered with very close and faint vertical striæ, which become stronger and curved on the later whorls, while close spirals cross the transverse striæ on the 2nd and 3rd whorls ; suture simple, rather shallow. Aperture subovate, peristome simple, acute, outer lip slightly curved forward, columella erect, margin strongly reflexed, nearly obscuring the rima.

Long. 5·5, lat. 2·3 ; apert., alt. 2·1, lat. 1·0 ; last whorl 3·5 mm.

Hab. Uganda, Mt. Elgon (*Woodhouse*).

Pseudopeas undulatum, sp. n.

Differs from *Ps. concinnum* chiefly in the columella, which is twisted, with a far more narrowly expanded margin, so that the rima is almost non-existent. There are 5 whorls, with very strong undulating spirals on the 2nd and close, well-defined, curved, vertical striæ on those succeeding it.

Long. 5·3, lat. 2·4 ; apert., alt. 2·4, lat. 1·0 ; last whorl 3·5 mm.

Hab. Camerun, Bitze (*Bates*).

The last two, together with other unfigured species, will be illustrated in a forthcoming paper.

Group B. Shell very small, with very convex whorls and moderately strong transverse costulæ.

Pseudopeas fusiforme, sp. n. (Pl. XIX. fig. 40.)

Shell very small, elongate-fusiform, umbilicate, silky, transparent, yellowish olivaceous. Spire produced, sides regular, apex submammillate. Whorls 7, very convex, gradually increasing, the first 2 microscopically spirally punctate, second also showing very faint, slightly backward, transverse striæ, remainder sculptured with fairly regular, not very strong, slightly curved, nearly vertical rib-striæ ; the spirals cut through the transverse striæ on the 2nd and 3rd and are patchily visible between them on the later

whorls; suture simple, much impressed. Aperture nearly ovate, peristome simple, acute, outer lip slightly curved forward and receding equally in profile, columella nearly straight, very slightly inclined inwards, margin very narrowly reflexed, hardly covering the very narrow umbilicus.

Long. 5·9, lat. 1·9; apert., alt. 1·5, lat. 0·8; last whorl 2·75 mm.

Hab. Camerun, Bitze (*Bates*).

A very beautiful little species, a long way distant from anything hitherto described; the rib-striæ are rather weaker than in the two which follow.

Pseudopeas elachistum, sp. n. (Pl. XIX. fig. 39.)

Shell very small, elongate-fusiform, narrowly umbilicate, silky, nearly transparent, yellow-corneous. Spire produced, sides regular, apex acutely rounded. Whorls $6\frac{1}{2}$, convex, gradually increasing, the 2 apical faintly microscopically transversely and strongly punctately spirally striate; remainder sculptured with strong, regular, nearly straight, vertical rib-striæ, with practically no trace of spiral sculpture; suture simple, deep. Aperture suboval, peristome simple, outer lip nearly vertical in profile, columellar straight, erect, margin narrowly reflexed, half covering the rima.

Long. 4·75, lat. 2·0; apert., alt. 1·4, lat. 0·8; last whorl 2·3 mm.

Hab. Kenya, Larogi Hills, 7000 ft. (*Percival*).

Smaller than the foregoing species, of darker colour, and with stronger closer riblets.

Pseudopeas burunganum, sp. n. (Pl. XIX. fig. 41.)

Shell very small, elongate-subulate, rimate, thin, silky, semitransparent, pale corneous. Spire moderately produced, sides regular, apex acute. Whorls 7, convex, gradually increasing, the 2nd showing very faint, flat spiral, crossing faint transverse striæ, which slope backward; succeeding whorls sculptured with moderately close, nearly straight, vertical riblets; suture subcrenulate, well defined. Aperture suboval, peristome simple, outer lip nearly vertical in profile, columella erect, margin extremely narrowly reflexed over the minute perforation.

Long. 4·1, lat. 1·6; apert., alt. 1·5, lat. 0·7; last whorl 2·2 mm.

Hab. Belgian Congo, Burunga, Mt. Mikeno (type); near L. Mutanda (*Kemp*).

Differs noticeably from the preceding species in having

much weaker spiral and stronger transverse striation on the earliest whorls.

Group C. Shell very small, with very convex whorls and strong transverse costæ, more distant than in Group B.

Pseudopeas igembiense, sp. n. (Pl. XIX. fig. 42.)

Shell very small, subulate, rimate, thin, asperate, yellow-corneous. Spire moderately produced, apex rounded. Whorls 5, convex, the first 2 microscopically spirally striate, with faint transverse striæ on the 2nd; remainder sculptured with strong, straight, vertical costæ, more distant on the last whorl, on the front of which about 12 are visible; suture deep, crenulate. Aperture subovate, peristome simple, outer lip slightly arched forward, columella erect, thickened, upper margin very narrowly reflexed, forming a minute rima.

Long. 4·3, lat. 2·1; apert., alt. 1·7, lat. 1·0; last whorl 2·6 mm.

Hab. Kenya, Igembi Hills, 6000 ft. (*Kemp*).

Pseudopeas chariesterum, sp. n. (Pl. XIX. fig. 43.)

Somewhat nearly allied to the preceding species, from which it differs in narrower spire and in the microscopic spiral striæ continuing to be visible between the ribs on the later whorls; the rima, also, is more pronounced. The shell contains 5 whorls and measures:

Long. 4·0, lat. 1·7; apert., alt. 1·3, lat. 0·7; last whorl 2·3 mm.

Hab. Uganda, Mt. Elgon (*Woodhouse*).

Pseudopeas elgonense, sp. n. (Pl. XIX. fig. 46.)

Shell small, elongate, umbilicate, thin, asperate, semi-transparent, pale olivaceous. Spire produced, sides slightly convex, apex submammillate. Whorls 6, convex, gradually increasing, the first smoothly punctate with faint microscopic spiral sculpture, the 2nd with very close, weak, transverse, crossed by rather weak spiral, striæ, remainder with strong, slightly curved, nearly vertical costæ, between which is visible extremely faint spiral sculpture; suture deep, crenulate. Aperture subrhomboid, peristome simple, outer lip hardly curved outward, but arched forward; columella erect, margin very narrowly reflexed, hardly covering the narrow umbilicus.

Long. 4·7, lat. 1·7; apert., alt. 1·1, lat. 0·7; last whorl 2·4 mm.

Hab. Uganda, Mt. Elgon (type, *Woodhouse*), between Mbarara and Kigezi; L. Mutanda (juv., *Kemp*).

Tanganyika, Dar-es-salaam (*Connolly*).

A larger bleached topotype contains 7 whorls and measures 5·6 × 2·0 mm.

A longer, proportionately narrower form than *Ps. chariesterum*, if the latter is mature, with slightly closer sculpture; it is obvious, however, that the two are very near akin.

Group D. Shell very small, whorls less convex than in Groups B and C, costulæ as in Group B.

Pseudopeas chlorum, sp. n. (Pl. XIX. fig. 47.)

Shell very small, fusiform, subrimate, thin, asperate, pale olivaceous. Spire moderately produced, apex submammillate. Whorls 5, convex, regularly increasing, the first 2 sculptured with very strong microscopic spiral striæ, which continue and pit with punctate lines the close, strong, regular, slightly curved, vertical costulæ on the three later whorls; suture deep, subcrenulate. Aperture ovate, peristome simple, outer lip slightly receding in a gentle curve to the base, columella rather concave, margin strongly reflexed, nearly concealing the rima.

Long. 4·0, lat. 1·75; apert., alt. 1·25, lat. 0·6; last whorl 2·2 mm.

Hab. Kenya, Eusso Nyiro (*Kemp*).

Pseudopeas stenoterum, sp. n. (Pl. XIX. fig. 48.)

Nearly allied to the preceding species, from which it differs in slightly more distant sculpture, there being 12 costulæ on the face of the 3rd and 13 on that of the 4th whorl, while there are 16 or 17 on the corresponding whorls of *Ps. chlorum*. The spiral striation of the first 2 whorls continues across the costulæ on the 3rd, but then ceases. The shell is rimate, contains 6 whorls, and measures:—

Long. 4·5, lat. 1·9; apert., alt. 1·4, lat. 0·6; last whorl 2·4 mm.

Hab. Kenya, between the Igembi Hills and Nyeri (*Kemp*).

Pseudopeas camerunense, sp. n. (Pl. XIX. fig. 44.)

Intermediate between Groups D and C. The shell contains 5 convex whorls, of which the first 2 are almost invisibly spirally striate and the 2nd is also covered with

close, faint, transverse striæ, remainder sculptured with close, slightly curved, nearly vertical, transverse costulæ.

Long. 4·0, lat. 1·8; apert., alt. 1·25, lat. 0·6; last whorl 2·2 mm.

Hab. Camerun, Bitze (*Bates*).

Group E. Shell very small, later whorls striate, not costulate and not very convex.

Pseudopeas bitzeense, sp. n.

Shell small, narrowly fusiform, rimate, thin, silky, normally pale olivaceous. Spire produced, apex narrowly rounded. Whorls 6, rather convex, regularly increasing, the first 2 faintly punctate and sculptured with extremely faint spiral striæ, which continue on to the 4th whorl; 3rd and later whorls covered with very close, strong, regular, curved, vertical striæ; suture crenulate, well defined. Aperture piriform, peristome simple, acute, outer lip evenly curved forward between suture and base, columella concave, margin strongly reflexed, almost concealing the rima.

Long. 5·8, lat. 2·1; apert., alt. 1·9, lat. 1·0; last whorl 3·25 mm.

Hab. Camerun, Bitze (*Bates*).

The apex is sharper and the spiral striation on 2nd whorl weaker than in *Ps. egens*, d'Ailly.

Pseudopeas orestias (Preston), 1911. (Pl. XIX. fig. 50.)

This species, described from Mt. Kenya, has also been collected by Kemp between that mountain and the Aberdare Range and between the Igembi Hills and Nyeri.

I figure an example from the last-mentioned locality. It is smaller than the preceding species, with stronger, curved, vertical striæ on the last three whorls, the first 2 being rather weakly spirally striate; the very narrow columellar reflexion almost covers the minute rima. The shell contains 5 flattish whorls, with simple, somewhat impressed suture.

Long. 4·2, lat. 1·7; apert., alt. 1·7, lat. 0·8; last whorl 2·7 mm.

This shell is a little more slender than the type of *orestias*, whose dimensions are given as 4 × 2, apert. 1 × nearly 0·5 mm., but it does not appear to be varietally distinct.

Pseudopeas iredalei, sp. n. (Pl. XIX. fig. 51.)

A rather squatter form than the foregoing, with shallower suture. Of the 5 flattish whorls, the 2nd shows close

engraved spirals and the later ones close, slightly curved, vertical striæ. The columellar margin is extremely narrowly reflexed, the narrow rima well exposed.

Long. 4·3, lat. 1·8; apert., alt. 1·8, lat. 0·8; last whorl 2·9 mm.

Hab. Uganda, between Entebbe and Masaka (*Kemp*).

Pseudopeas kekumeganum, sp. n. (Pl. XIX. fig. 52.)

Differs from the rest of its group in its more straight-sided spire and slightly different volution. There are 6 whorls, the second being weakly microscopically striate both spirally and transversely, the next 4 covered with close, weak, curved vertical striæ; the columellar margin is narrowly reflexed, forming a clear rima.

Long. 5·0, lat. 2·1; apert., alt. 2·1, lat. 0·9; last whorl 3·0 mm.

Hab. Kenya, Kekumega (*Percival*).

Pseudopeas egens (d'Ailly), 1896. (Pl. XIX. fig. 49.)

As this species has never been figured, I illustrate a paratype from Kitta, Camerun.

Pseudopeas rumrutiense (Preston), 1911.

This species, described as an *Opeas*, appears to be widely distributed, with very little racial variation, over a large area, having been collected in Kenya Colony by Percival at Urguess and by Kemp at Rumruti, Nakuru, Naivasha, and between Mt. Kenya and the Aberdare Range, and in Uganda by Woodhouse on Mt. Elgon and by Kemp between Entebbe and Masaka. The spiral sculpture is very faint indeed on the apical whorls of the type-series and much more plainly visible on specimens from some other localities, such as Mt. Elgon, while the transverse sculpture also varies a little in strength in different sets, but it is of the same pattern throughout and affords no ground for varietal distinction.

Genus Opeas, Albers, 1850.

Small Stenogyroid shells, not usually exceeding 14 mm. in length, with gradually increasing whorls, of which the first two are devoid of spiral sculpture.

Opeas euschemon, sp. n. (Pl. XIX. fig. 36.)

Shell small, elongate-subulate, imperforate in the type, thin, asperate, transparent, vitreous. Spire produced, apex

submammillate. Whorls 8, convex, gradually increasing, the first 2 smoothly microscopically punctate, remainder covered with strong, regular, nearly straight, vertical costæ, which become almost obsolete on the paries and number about 13 on the face of the last whorl, where they are rather more distant than on the preceding one; suture deep, hardly crenulate. Aperture elliptical, peristome simple, outer lip vertical in profile, columella concave, thickened upwards from the base.

Long. 6·2, lat. 2·0; apert., alt. 1·2, lat. 1·0; last whorl 2·8 mm.

Hab. Kenya, Kekumega (*Percival*).

Except for its apex showing no spiral sculpture, this species would appear better placed in *Pseudopeas*.

Opeas marginatum, sp. n. (Pl. XIX. fig. 9.)

Shell of fair size, elongate-turriform, rimate, thin, rather silky, pale olivaceous. Spire produced, sides regular, apex rounded. Whorls 7½, rather flat, regularly increasing, the first 1½ smooth, the next showing very faint vertical striæ, which are much stronger and become increasingly curved on the later whorls, though almost absent from the base of the last; suture impressed, very narrowly margined on the last 2 whorls. Aperture quadrate, peristome simple, acute, outer lip slightly arched forward and inflected inward, much recurved in profile to the base; columella erect, with a slight inward bulge halfway up, margin rather closely reflexed, forming a small rima.

Long. 12·3, lat. 3·8; apert., alt. 3·7, lat. 1·7; last whorl 6·0 mm.

Hab. Kenya, Rumruti (*Kemp*).

A very ordinary looking species, with a finer apex than the next four, and remarkable for the strongly curved profile of its outer lip.

The next group of four, at first glance, very closely resemble each other; all are of rather ungraceful subulate contour, with rather coarse apex and very similar volution. The sculpture in each, however, differs so widely from that of its fellows, that it seems impossible to unite them:—

Opeas lamoense (M. & P.), 1892.

1892. *Buliminus lamoensis*, M. & P., Ann. & Mag. Nat. Hist. ix. p. 90, pl. v. fig. 12.

1911. *Curvella alabastrina*, Prest., Rev. Zool. Africaine, i. p. 221, pl. xi. fig. 9.

As *C. alabastrina*, Preston, is preoccupied by *C. alabastrina*, da Costa, 1906, the former cannot stand, but it is unnecessary to rename the species, as it appears to be quite inseparable from *lamoense*, M. & P. The latter has a wide coastal distribution from Lamo Island (*Layard*), *via* Mombasa (*Connolly*) and Gazi (*Kemp*), to Zanzibar (*Craven*), while its inland connection to Naivashi (*alabastrina*, Kemp) can be linked up through Mt. Nyeri (*Kemp*).

Sets from different localities vary slightly in obesity, and very fresh individuals sometimes show faint and extremely evanescent microscopic spiral sculpture on the 2nd and 3rd whorl, but there is no valid distinction between them, and the species appears best placed in *Opeas*. *O. shimbiense* (Prest.) is at most only a local race of *lamoense*, with very slightly finer apex, while it is almost impossible to separate *lamoense* itself from such examples as I have seen of *O. vulgare*, Morelet, from the Comoro Islands.

Opeas psephenum, sp. n. (Pl. XIX. fig. 10.)

Shell of moderate size, fusiform, rimate, thin, slightly silky, transparent, pale olivaceous. Spire produced, apex rounded. Whorls 7, moderately convex, regularly increasing, the first 2 micropunctate, remainder covered all over with close, regular, nearly straight, vertical striæ, which are slightly recurved below the periphery of the last whorl; suture simple, of moderate depth. Aperture subrhombic, peristome simple, acute, outer lip very slightly inflexed, moderately arcuate forward and receding further to the base; columella erect, margin narrowly and closely reflexed, forming a minute rima.

Long. 10·2, lat. 3·5; apert., alt. 3·6, lat. 1·5; last whorl 5·8 mm.

Hab. Kenya, Larogi Hills (*Percival*).

Differs from *O. lamoense* principally by its straighter and rather stronger sculpture.

Opeas tapeinum, sp. n. (Pl. XIX. fig. 11.)

Differs from *O. psephenum* in having rather more convex whorls, slightly coarser sculpture, and in being practically imperforate in the adult stage. The shell contains 7 moderately convex whorls, the second of which shows traces of extremely faint, close, microscopic transverse and spiral striation; the suture is simple and well defined; outer lip but little curved forward, receding rather more to the base; columella inclined very slightly inwards, practically devoid

of marginal reflexion in the adult stage, so that the shell is imperforate.

Long. 11·3, lat. 3·5 ; apert., alt. 3·7, lat. 1·5 ; last whorl 5·7 mm.

Hab. Kenya, Rumruti (type) ; Igembi Hills (*Kemp*).

There is a certain amount of variation in sculpture and perforation between individual shells of this species ; some are transversely sculptured almost to the apex, and some show distinct patches of apparently incised transverse striæ on the later whorls ; as the sculpture on the rest of the shell, however, is normal, this does not appear to justify separation. The perforation differs slightly in accordance with the extent to which the columellar margin is reflexed.

Opeas aphantum, sp. n. (Pl. XIX. fig. 12.)

Shell of fair size, elongate-turriform, subrimate, thin, somewhat silky, pale olivaceous. Spire produced, apex narrowly rounded. Whorls 6, rather flat, gradually and regularly increasing, the 2nd covered with microscopic transverse striæ with a reverse slope, remainder sculptured with faint, regular, nearly vertical striæ, which are rather fainter below the periphery and increase in curve on each succeeding whorl; suture rather oblique, simple, well defined. Aperture subovate, peristome simple, acute, outer lip only slightly curved forward, but receding considerably to the base ; columella inclined inward, somewhat twisted, margin so closely reflexed that the minute rimation is only visible under a microscope.

Long. 9·8, lat. 3·2 ; apert., alt. 2·9, lat. 1·2 ; last whorl 5·2 mm.

Hab. Kenya, Mt. Kenya, 6–8000 ft. (*Kemp*).

A rather insignificant symmetrical little species, apparently distinct from anything hitherto described from this region.

Opeas marsabitense, sp. n. (Pl. XIX. fig. 1.)

Shell small, elongate-fusiform, rimate, thin, glossy, transparent, pale olivaceous. Spire produced, sides slightly convex, apex rounded. Whorls 6½, rather flat, regularly increasing, the first 1½ smoothly micropunctate, the next faintly transversely striate, remainder covered with strong, close, regular, curved, vertical striæ, which almost disappear on the base ; suture simple, shallow. Aperture subovate, peristome simple, acute, outer lip arcuate evenly forward, columella straight, very slightly inclined inward, margin reflexed, forming a clear rima.

Long. 8·0, lat. 2·4 ; apert., alt. 2·5, lat. 1·0 ; last whorl 4·1 mm.

Hab. Kenya, Mt. Nyiro, S. of L. Rudolph, 8300 ft. (type) ; Mt. Marsabit, 4600 ft. (*Percival*).

A well-defined species, with rather longer whorls than most of its allies.

Opeas woodhousei, sp. n. (Pl. XIX. fig. 2.)

Shell small, turriform, rimate, thin, silky, transparent, pale olivaceous. Spire produced, sides regular, apex rounded. Whorls 7, not very convex, regularly increasing, the first 2 practically smooth, remainder covered with rather weak vertical striæ, not much curved on the 3rd to 6th whorls, more so on the last ; suture simple, well defined. Aperture subovate, peristome simple, acute, outer lip arcuate evenly forward, with slight inflexion at its foremost point; columella erect, margin narrowly reflexed, forming a small rima.

Long. 7·0, lat. 2·4 ; apert., alt. 2·6, lat. 1·25 ; last whorl 3·8 mm.

Hab. Uganda, Mt. Elgon (*Woodhouse*).

Opeas aræum, sp. n. (Pl. XIX. fig. 35.)

An almost exact miniature of the foregoing species, but probably quite distinct by reason of its smaller size. The shell contains $6\frac{1}{2}$ whorls and measures :

Long. 5·3, lat. 1·8 ; apert., alt. 2·1, lat. 0·75 ; last whorl 3·2 mm.

Hab. Kenya, Kekumega (*Percival*).

Opeas pervitreum, sp. n. (Pl. XIX. fig. 34.)

Shell small, aciculate, rimate, thin, silky, transparent, pale olivaceous. Spire produced, sides regular, apex rounded. Whorls 8, convex, very gradually increasing, the first 2 smoothly micropunctate, remainder covered with very close, fine, regular, slightly curved, vertical striæ ; suture simple, well defined. Aperture subovate, peristome simple, acute, outer lip gently and evenly arched forward, columella straight, erect, upper margin slightly reflexed, forming a small rima.

Long. 6·1, lat. 1·9 ; apert., alt. 1·75, lat. 0·9 ; last whorl 3·0 mm.

Hab. Kenya, Gazi (*Kemp*).

A smaller form than *O. delicatum* (Taylor), being not only more slender, but possessing a whorl more in considerably shorter length.

Opeas thomasi, sp. n. (Pl. XIX. fig. 3.)

Shell small, elongate-turriform, subrimate, thin, smooth, shining, transparent, pale olivaceous, Spire produced, sides regular, apex narrowly rounded. Whorls 9, rather flat, gradually increasing, the first 3 practically smooth except for traces, on the 2nd and 3rd, of faint, irregular, spiral scratches ; remainder covered with very close, faint, regular, nearly straight and vertical striæ, very slightly retracted below the suture and becoming fainter and retracted below the periphery; the spiral scratches continue throughout, cutting through the transverse striæ; suture simple, shallow. Aperture subovate, peristome simple, acute, outer lip nearly straight, lower half receding slightly to the base ; columella straight, vertical, margin very narrowly, almost adnately reflexed, nearly concealing the minute rima.

Long. 8·3, lat. 2·5 ; apert., alt. 2·5, lat. 1·0 ; last whorl 3 8 mm.

Hab. Belgian Congo, Mukanda, near L. Kivu (type), and Uganda, between Mbarara and Kigezi (*Kemp*).

The race from the second locality are slightly more obese than the type, but hardly varietally separable ; a specimen with $8\frac{1}{2}$ whorls measures $8{\cdot}0 \times 2{\cdot}4$ mm.

This pretty little species has the form of *Opeas*, and the spiral scratches differ so much from the regular spiral sculpture of *Pseudopeas* that I do not consider it referable to the latter genus.

Opeas natermanni, sp. n. (Pl. XIX. fig. 4.)

Shell small, subulate-fusiform, subrimate, thin, transparent, pale olivaceous. Spire produced, sides regular, apex rounded. Whorls 7, convex, gradually increasing, the first 2 practically smooth, remainder covered with close, regular, faint, slightly curved, vertical striæ ; suture simple, well defined. Aperture subovate, peristome simple, acute, outer lip arched slightly forward and receding a little more to the base ; columella erect, margin extremely narrowly reflexed, forming a minute rima.

Long. 6·5, lat. 2·2 ; apert., alt. 2·0, lat. 1·0; last whorl 3·3 mm.

Hab. Uganda, Mt. Elgon (*Woodhouse*).

Preston had intended to name this species in honour of the late Carl Natermann during the latter's lifetime, and I now respectfully dedicate it to his memory. The shell very closely resembles *O. thomasi*, from the young of which it differs in its sculpture being a little more arcuate and not quite so fine and close.

Opeas toroense, sp. n. (Pl. XIX. fig. 38.)

Shell minute, aciculate, perforate, thin, silky, transparent, pale olivaceous. Spire produced, sides regular, only slightly tapering, apex rounded. Whorls $5\frac{1}{2}$, convex, very gradually increasing, the apical $1\frac{1}{2}$ practically smooth, remainder sculptured with faint vertical striæ, somewhat irregular in prominence and curvation; suture simple, rather deep. Aperture subovate, peristome simple, acute; outer lip somewhat curved forward and nearly vertical in profile; columella straight, margin rather narrowly triangularly reflexed, forming a clear rima.

Long. 3·25, lat. 1·8; apert., alt. 0·8; last whorl 1·6 mm.

Hab. Uganda, near Fort Portal (*Fisher*); between Mbarara and Kigezi (*Kemp*).

This minute species appears to be a true *Opeas*; among several specimens examined under fifty-fold magnification I have failed to detect any constant appearance of spiral sculpture.

Opeas glischrum, sp. n. (Pl. XIX. fig. 28.)

Shell very small, aciculate, imperforate, thin, smooth, shiny, transparent, pale yellowish olivaceous. Spire produced, apex rounded. Whorls 6, not very convex, regularly increasing, almost smooth except for extremely faint, rather irregular growth-lines and patches of very close spiral striation, almost invisible under fifty-fold magnification, on the last 2 whorls; suture simple, well defined. Aperture subpiriform, peristome simple, acute, outer lip curved a little backward in profile to the base, columella erect, meeting the base without truncation or marginal reflexion.

Long. 5·7, lat. 1·75; apert., alt. 1·75, lat. 0·9; last whorl 3·4 mm.

Hab. Uganda, between Mbarara and Masaka (*Kemp*). Type in British Museum.

An insignificant little shell, which could easily be attributed to half a dozen different genera; it does not quite harmonise with either of the next two sections, so I place it, for the present, in *Opeas*, s. s.

Section Nothapalinus, nov.

Very small imperforate shells, yellowish olivaceous in colour, with truncate columella and peculiarly long last whorl, in which respect they resemble *Nothapalus*, von Martens.

Type, *Subulina kempi*, Preston.

I place this section in *Opeas* on account of its small size, but its truncate columella might afford equally good cause for its attribution to *Subulina*. *Geostilbia stuhlmanni*, Mts., appears, from the author's figure, to belong to this group.

Opeas (*Nothapalinus*) *suavissimum*, sp. n.
(Pl. XIX. figs. 32, 33.)

Shell small, aciculate, imperforate, thin, smooth, shiny, transparent, pale olivaceous. Spire produced, sides regular, apex rounded. Whorls 6, not very convex, regularly increasing, all but the apex covered with very faint, straight, transverse striæ, gradually becoming more oblique, while there are a few very faint, rather distant, flat spiral striæ, only visible under a strong microscope, on the 2nd and 3rd whorls, and extremely close, punctate, microscopic spiral sculpture throughout; suture oblique, simple, fairly deep. Aperture subrhombic, rounded at base, peristome simple, acute, outer lip slightly curved outward, nearly straight in profile, receding considerably to the base; columella short, erect, markedly truncate.

Long. 8·1, lat. 2·2; apert., alt. 2·0, lat. 1·0; last whorl 4·5 mm.

Hab. Kenya, Nairobi (type, *Falloon*), Mt. Marsabit (*Percival*); Gazi (*Kemp*).

A beautiful little species, which should be more slender than *stuhlmanni*, Mts., whose diameter is given as 3 mm., while it differs from *kempi* in the more rapid increase of its later whorls; in a paratype of *kempi*, 7·8 mm. long and containing $6\frac{1}{2}$ whorls, the last measures only 3·1 mm.

Individuals vary somewhat in diameter, an emaciate example from Gazi (Pl. XIX. fig. 33), which contains $5\frac{1}{2}$ whorls, measuring:

Long. 7·5, lat. 1·9; apert., alt. 2·2, lat. 1·0; last whorl 4·3 mm.

Opeas (*Nothapalinus*) *kempi*, Preston, 1912.
(Pl. XIX. fig. 31.)

1912. *Subulina kempi*, Prest., Rev. Zool. Africaine, i. p. 324, pl. xvii. fig. 15.

I illustrate this species for purpose of comparison.

Section Micropeas, nov.

Very small imperforate shells, usually colourless vitreous, with rather slowly increasing whorls and no columellar truncation.

Type, *Opeas* (*Micropeas*) *péringueyi*, Conn.

This very distinct little group resembles *Opeas* in form, differing from *Cæcilioides* in having much shorter whorls; but the vitreous texture is that of the latter genus, and it may become necessary to transfer the section thereto when its anatomy is known.

Opeas (*Micropeas*) *péringueyi*, sp. n. (Pl. XIX. fig. 24.)

Shell very small, aciculate, imperforate, thin, smooth, shining, transparent, vitreous. Spire produced, summit (3 whorls) sub-bulbous, apex narrowly rounded. Whorls 7, moderately convex, regularly and gradually increasing, the first 3 smooth, with faintest symptoms of close microscopic spiral lines, remainder covered with very faint, close, curved vertical striulæ, only visible under the microscope; suture very narrowly margined, well defined. Aperture subpiriform, peristome simple, acute; outer lip curved a little forward, receding further to the base; columella slightly concave, not reflexed, its base merging into the peristome in an even curve, without truncation.

Long. 6·6, lat. 1·9; apert., alt. 1·7, lat. 0·75; last whorl 3·3 mm.

A larger damaged example is 7·1 mm. in length.

Hab. Natal, Mfongosi (*W. E. Jones*).

Type in South African Museum, Cape Town.

I have the greatest pleasure in dedicating this beautiful little species to Dr. L. Péringuey, Director of the South African Museum.

Subsp. *lathon*, nov. (Pl. XIX. fig. 25.)

Similar to the above, but a litte smaller in all its parts, containing $6\frac{1}{2}$ whorls and measuring:—

Long. 5·3, lat. 1·4; apert., alt. 1·5, lat. 0·6; last whorl 2·7 mm.

Hab. Natal, Port Natal (*J. Sanderson*).

Type in British Museum.

Presented to the Museum in 1861, this shell was classified as "*Stenogyra turriformis*, Krs. (*juv.*)," to which may be due the reason for its having been overlooked until now. If further examples are ever collected, they may prove worthy of full specific rank, but the growth of Durban docks and city during the last sixty years has completely obliterated many of the old hunting-grounds for Mollusca, and it may well be that the race has become extinct.

Opeas (*Micropeas*) *callipeplum*, sp. n. (Pl. XIX. fig. 26.)

Still smaller than the foregoing, with weaker transverse sculpture, but traces of extremely faint, fine, close, microscopic spiral striation throughout. The shell contains 6 whorls and measures:

Long. 4·5, lat. 1·25; apert., alt. 1·3, lat. 0·6; last whorl 2·3 mm.

Hab. Kenya, Eusso Nyiro (type, *Kemp*) Lorian Swamp (*Percival*).

Opeas (*Micropeas*) *euphues*, sp. n. (Pl. XIX. fig. 27.)

Shell very small, acicular, imperforate, thin, smooth, shining, transparent, pale yellowish olivaceous. Spire produced, summit (2 whorls) sub-bulbous, apex narrowly rounded. Whorls 7, rather flat, later slightly gradate, the first 2 very closely and finely microscopically spirally striate, remainder covered with close, faint, regular, curved, vertical striæ, on which the spiral sculpture of the protoconch continues to be visible in patches; suture simple, well defined. Aperture subrhombic, peristome simple, acute; outer lip somewhat curved forward and receding about equally to the base; columella erect, considerably thickened upwards, very slightly tortuate, but not truncate, at its extreme base.

Long. 6·4, lat. 1·7; apert., alt. 1·8, lat. 0·7; last whorl 2·8 mm.

Hab. Camerun, Bitze (*Bates*).

A pretty little species, which, by reason of its stronger sculpture and less vitreous texture, ought perhaps to be placed in *Pseudopeas*, rather than in the new section.

Subfamily *Cœliaxinæ*, Pilsbry, 1904.

Genus Cœliaxis, Adams & Angas, 1865.

Cœliaxis layardi, Adams & Angas, 1865, subsp. *kincaidi*, nov. (Pl. XIX. fig. 23.)

Differs from the type in its more slender form, shorter whorls, and continuous peristome. An average adult example of *C. layardi*, measuring 30·5 × 7·2 mm., contains 20 whorls and may be altogether devoid of callus or possess a very thin transparent one. In the new subspecies the callus is opaque white, straight, and so thick that it forms an upstanding continuous peristome; the shell contains 22½

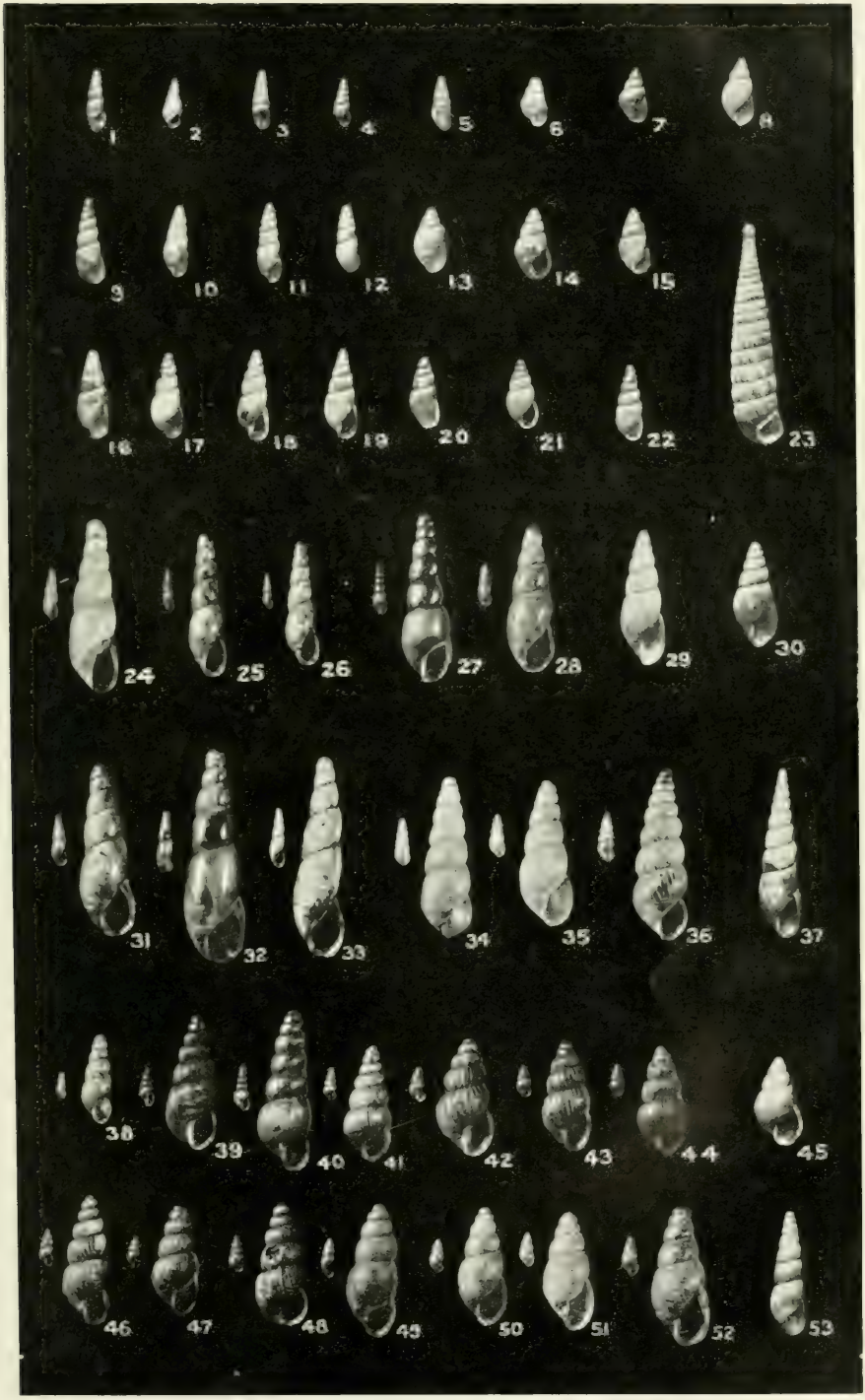
whorls and measures 30·5 × 6·5 mm. ; another specimen contains 21½ whorls in a length of 28·2 mm.

Hab. Cape Province, East London (*Kincaid*).

This well-defined race has only been collected so far in a single locality, where it appears to be quite constant ; time may well prove it to be worthy of specific rank.

EXPLANATION OF PLATE XIX.

Fig. 1. *Opeas marsabitense*, Conn.
Fig. 2. —— *woodhousei*. Conn.
Fig. 3. —— *thomasi*, Conn.
Fig. 4. —— *natermanni*, Conn.
Fig. 5. *Pseudopeas tenue*, Conn.
Fig. 6. —— *imitans*, Conn.
Fig. 7. *Curvella batesi*, Conn.
Fig. 8. —— *inornata*, Chaper.
Fig. 9. *Opeas marginatum*, Conn.
Fig. 10. —— *psephenum*, Conn.
Fig. 11. —— *tapeinum*, Conn.
Fig. 12. —— *aphantum*, Conn.
Fig. 13. *Curvella campyla*, Conn.
Fig. 14. —— *elgonensis*, Conn.
Fig. 15. —— ——, var. *woodhousei*, Conn.
Fig. 16. —— *pertranslucens falloni*, Conn.
Fig. 17. *Euonyma percivali*, Conn.
Fig. 18. —— *blayneyi*, Conn.
Fig. 19. —— *arthuri*, Conn.
Fig. 20. —— *topazon*, Conn.
Fig. 21. —— *perniteus*, Conn.
Fig. 22. —— *eussoensis*, Conn.
Fig. 23. *Cæliaxis layardi kincaidi*, Conn.
Fig. 24. *Opeas* (*Micropeas*) *péringueyi*, Conn.
Fig. 25. —— (——) —— *lathon*, Conn.
Fig. 26. —— (——) *callipeplum*, Conn.
Fig. 27. —— (——) *euphues*, Conn.
Fig. 28. —— *glischrum*, Conn.
Fig. 29. *Euonyma fulgens*, Conn.
Fig. 30. —— —— *nyiroensis*, Conn.
Fig. 31. *Opeas* (*Nothapalinus*) *kempi*, Preston.
Fig. 32. —— (——) *suavissimum*, Conn.
Fig. 33. —— (——) ——, forma *emaciata*.
Fig. 34. —— *pervitreum*, Conn.
Fig. 35. —— *arœum*, Conn.
Fig. 36. —— *euschemon*, Conn.
Fig. 37. *Euonyma terebræformis*, Conn.
Fig. 38. *Opeas toroense*, Conn.
Fig. 39. *Pseudopeas elachistum*, Conn.
Fig. 40. —— *fusiforme*, Conn.
Fig. 41. —— *burunguum*, Conn.
Fig. 42. —— *igembiense*, Conn.
Fig. 43. —— *chariesterum*, Conn.
Fig. 44. —— *camerunense*, Conn.
Fig. 45. *Curvella masakana*, Conn.



AFRICAN STENOGYRINÆ AND CŒLIAXINÆ.

Fig. 46. *Pseudopeas elgonense*, Conn.
Fig. 47. —— *chlorum*, Conn.
Fig. 48. —— *stenoterum*, Conn.
Fig. 49. —— *egens*, d'Ailly.
Fig. 50. —— *orestias*, Preston.
Fig. 51. —— *iredalei*, Conn.
Fig. 52. —— *kekumeganum*, Conn.
Fig. 53. *Euonyma pareimena*, Conn.

LXVIII.—*Descriptions of Three Species of* Notogomphus (*Odonata*) *from East Africa.* By Herbert Campion.

In 1858 De Selys Longchamps described two new Gomphine dragonflies from Abyssinia—a unique male and a unique female—under the names of *Gomphus ruppeli* and *G. dorsalis*, respectively. At the same time he pointed out that they formed a distinct group within the genus, and proposed the application to that group of the name *Notogomphus* in the event of its becoming necessary, as was afterwards the case, to raise it to separate generic rank (Monogr. Gomph. pp. 119, 162, 164). The genotype is *N. ruppeli*, and De Selys's description was accompanied by figures by Hagen of the anal appendages and other structural details (*loc. cit.* pl. ix. fig. 4). Our knowledge of this type-specimen has been completed by the publication of Ris's figures of the wing-venation and thoracic colour-pattern [Ber. Senckenb. Ges. Frankfurt-a.-M. xl. pp. 26–27 (1909)]. Particulars of a female of *N. ruppeli*, from Neu Moschi, German East Africa, have been given by R. Martin [Voy. Alluaud et Jeannel Afrique Orient., Pseudonév. p. 36 (1915)]. Later additions which have been made to the genus are :—

N. stuhlmanni, Karsch, ♀, from "Südostküste Afrika's" [Ent. Nachr. xxv. p. 376 (1899)] ;

N. nyassicus, Grünb., ♀, from Langenburg, German East Africa (now Tanganyika Territory) (SitzBer. Ges. natf. Freunde, Berlin, 1902, p. 234) ;

N. agilis, R. Martin, ♂, from Portuguese Guinea [Ann. Mus. Civ. Genova, xliii. p. 657 (1908)] ; and

N. ruppeli longus, ♀, R. Martin, from British East Africa (now Kenya Colony) [Voy. Alluaud et Jeannel Afrique Orient., Pseudonév. p. 36, pl. ii. fig. 6 (1915)].

It is not at all certain that all these species really belong to the genus to which they have been referred, and Dr. Ris, who has examined the type of *N. agilis*, has already indicated

that that species is probably not a true *Notogomphus* (*loc. cit.* pp. 25–26).

Pending a revision of the genus, it is assumed that the three species now to be discussed are congeneric both with each other and with the genotype, especially as the anal appendages of the males are strikingly similar in structure. At the same time, the three species in question differ rather markedly from the genotype in respect of the thoracic pattern, and a good deal of variation is to be found in the structure of the second anal area of the hind wings. Thus, Ris's photograph of the left hind wing of *N. ruppeli* shows four rows of postanal cells, the first two cells being undivided. In *N. longus* the second anal area may be filled either by three symmetrical rows of cells or else by one column of three cells and another column of four cells. In the male of *N. lecythus* the hind wing is relatively very broad and the vertical columns may contain any number of cells ranging from four to seven.

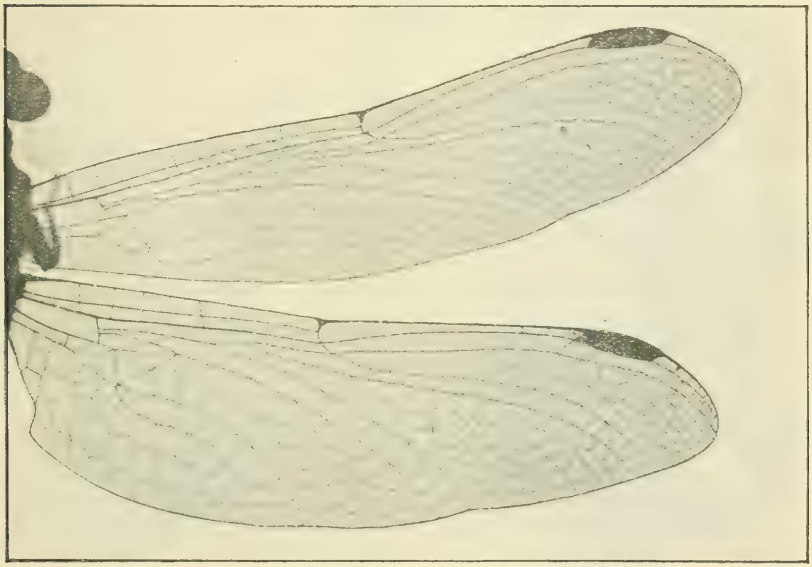
I have not seen the genotype of *Podogomphus* (*P. spinosus*, Karsch, 1890, from Cameroon), and no figures of the male anal appendages, wing-venation, or thoracic pattern appear to be accessible. Nevertheless, I have before me a specimen of *P. praetorius*, Selys, from Southern Rhodesia, a species which is commonly regarded as being congeneric with the West African *P. spinosus*. I have not yet succeeded, however, in discovering any really distinctive characters whereby *Podogomphus* may be separated generically from *Notogomphus*, and the material to be dealt with herein is referred to *Notogomphus*, mainly on the grounds of convenience and probability. The types of the species described by Sjöstedt from Kilimanjaro and Meru, and placed by him in *Podogomphus*, likewise remain unknown to me, but the description and figure of *Podogomphus kilimandjaricus*, Sjöst., 1910, which is also a female, agree so well with the type of *Notogomphus longus*, R. Martin, 1915, that the identity of these two insects seems to be reasonably certain. On the other hand, none of the published descriptions in *Notogomphus* and *Podogomphus* seem to apply to either of the two species which I now venture to bring forward as new.

Notogomphus longus, R. Martin.

Although the fact is not stated in the original description, the actual type of this insect is a female in the British Museum (Natural History) studied by R. Martin some years earlier, and marked by him as the type of *Notogomphus ruppeli longus*. Further material, including two males which

are obviously conspecific with Martin's type, is now available for study, and an exact comparison of these males with the (male) type of *N. ruppeli*, from Abyssinia, is made possible by the existence of the above-mentioned figures by Hagen and Ris. It can therefore be said that, while the insects compared are closely related to each other, they are at the same time specifically distinct, and consequently Martin's insect should in future be known as *Notogomphus longus*, unless, indeed, its true name should prove to be *N. kilimandjaricus*, Sjöst.

Fig. 1.



Notogomphus longus, R. Martin. Right wings of allotype ♂.
F. W. Campion photo.

1 ♂ (allotype), Nairobi, Kenya Colony, 1. xi. 1919 (*A. Loveridge*).

Length of abdomen 36 mm.; hind wing 31 mm.

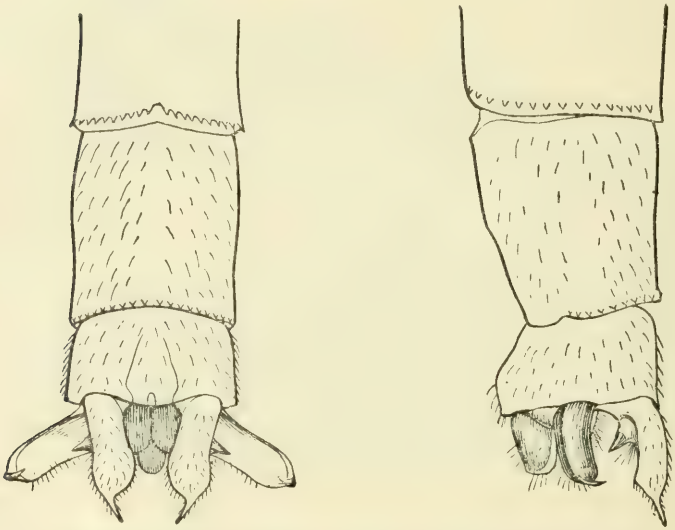
Lips, clypeus, and frons yellow; vertex and antennæ dark orange-brown. Frons projecting conspicuously in front; its dorsal surface bounded anteriorly by a somewhat rounded ridge. Occiput yellow, not greatly expanded posteriorly, rising sharply towards the hind margin, which forms a much thickened, slightly convex, dark brown crest, with a yellow spot in the middle.

Prothorax dark orange-brown, broadly yellow in the middle line.

Meso-metathorax dark orange-brown dorsally; a broad mid-dorsal yellow stripe, having on each side a narrower yellow stripe contiguous with it for the posterior two-thirds of its length; two narrow yellow lines near the humeral suture; yellow at sides and below.

Wings (fig. 1) slightly tinged with yellow. Costa golden; other veins reddish brown. Pterostigma 3·5 mm. long, braced, brownish yellow, enclosed by black veins. Membranule of hind wing vestigial, white. Wings rather

Fig. 2.



Notogomphus longus, R. Martin. Anal appendages of allotype ♂.
P. Highley cam. luc. et del.

narrow at base. In the hind wings the first two postanal cells form an ill-defined anal loop; below the loop are two columns with two cells in each; two postanal cells at hind margin. Basal subcostal cross-vein present in all wings; first and fifth antenodals reinforced. Anal triangle 3-celled.

Legs: femora yellow, lined with black; tibiæ and tarsi black; femur of hind legs reaching beyond the apical margin of abdominal segment 2, and furnished with two rows of spines, short and robust in the proximal half, and mostly long and powerful in the distal half.

Abdomen: segments 1 and 2 inflated, 3–6 cylindrical, 7–9 in lateral view convexly curved below, 10 about half as long as 9. Segments 1 and 2 dark orange-brown above, with a wide mid-dorsal yellow stripe, taking on a trilobed form on 2, which gives off on each side a short yellow line; 3–6 black above, with a mid-dorsal yellow line, becoming narrower on each succeeding segment; a black ring at the apex of 2–6; 7 entirely yellow, except for a large black U-shaped marking at the apex; 8–10 dark reddish brown, with a pair of obscure dark longitudinal markings on 8: in lateral view the dark areas on 1–6 are seen to take on the appearance of dark stripes on a yellow ground: ventral surface of abdomen yellow, with a black ring at the apex of segments 3-6.

Auricles yellow; the external margin narrowly lined with black, and with a row of small black denticles posteriorly. The hamules on segment 2 are barely distinguishable from those of *N. ruppeli*, as figured by Hagen, except that, at the apex of the second hamule, the hook is shorter and the emargination shallower than in the Selysian species. Anal appendages (fig. 2): upper pair yellow; the internal margin narrowly lined with black; latero-ventral tooth mainly black: branches of lower appendage black.

1 ♂, Parklands, Nairobi, 18. v. 15 (R. 3831) (*A. Loveridge*).

Length of abdomen 38·5 mm.; hind wing 32·5 mm.

Below the anal loop in the hind wing are two columns of postanal cells, with two or three cells in each.

Otherwise similar to the allotype.

1 ♀ (Martin's holotype), Nairobi Plains, Kenya Colony, 5400 feet, 16. v. 1900 (*Richard Crawshay*).

Length of abdomen 39·5 mm.; hind wing 34·5 mm.

In the hind wings the first two postanal cells form an ill-defined anal loop; below the loop are two columns with two or three cells in each; three postanal cells at the posterior margin.

"Its chief colouring is light yellowish green" (note by collector).

1 ♀, Parklands, Nairobi, 18. v. 1915 (*A. Loveridge*).

Length of abdomen 40 mm.; hind wing 35 mm.

Second anal area in hind wing as in holotype.

1 ♀, Kisumu Nyanza Province, Kenya Colony, vii.–viii. 1919 (*V. G. L. van Someren*).

Length of abdomen 38·5 mm. ; hind wing 34·5 mm.

Second anal area in hind wing as in holotype, except that there are two or three postanal cells at the posterior margin.

1 ♀, Nairobi, 1. xi. 1919 (*A. Loveridge*).

Length of abdomen 37·5 mm. ; hind wing 32·5 mm.

Second anal area in hind wing as in holotype, except that there are two or three postanal cells at the posterior margin.

In coloration the female closely resembles the male, excepting that the ground-colour of the thorax and abdominal segments 1 and 2 is chocolate-brown, and segments 8–10 are light reddish brown, with a pair of rather distinct dark longitudinal markings on 8; moreover, the dark lateral areas on 1–6 are emphatically in the form of stripes.

Occiput wholly yellow ; the posterior crest less thickened and more elevated than in male, very hairy behind ; a very deep and wide groove, extending between the eyes immediately in front of the posterior crest.

Auricles on abdominal segment 2 wholly yellow, very small, and without denticles.

Anal appendages about as long as segment 10, conical, abruptly pointed at the end, yellow.

The slightly dilated margins of segments 7–9 bordered with black denticles.

Vulvar lamina yellow, about a quarter as long as segment 9, with a deep, angular excision apically.

Notogomphus lecythus, sp. n.

1 ♂ (holotype), Zegi, Lake Tsana, Abyssinia, v.–vi. 1902 (*Degen*).

Length of abdomen 41 mm.; hind wing 31 mm.

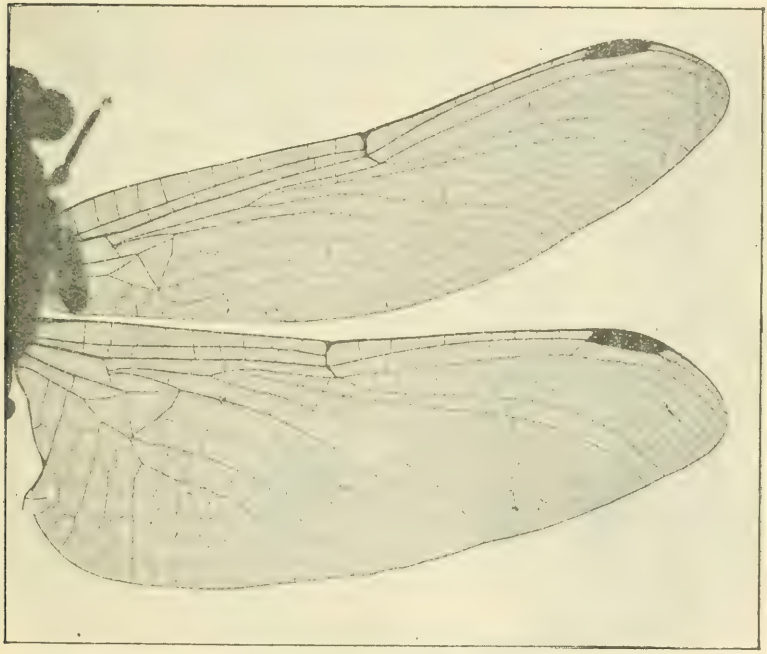
Lips, clypeus, and frons yellow ; vertex and antennæ dark orange-brown. Frons, which is carinated anteriorly, not projecting in front as conspicuously as in *N. longus*. Occiput wholly yellow, much expanded posteriorly, rising gradually towards the hind margin, which forms a slightly thickened, strongly convex, and very hairy crest.

Prothorax dark orange-brown, broadly yellow in the middle line.

Meso-metathorax dark orange-brown dorsally ; the mid-dorsal yellow stripe and its lateral basal expansions much as described for *N. longus*, but recalling the outline of the oil-bottles ("lekythi") of classical Greece ; two narrow yellow lines lie close to the humeral suture ; yellow at sides and below.

Wings (fig. 3) rather strongly tinged with yellow. Costa golden; other veins reddish brown. Pterostigma 3·5 mm. long, braced, brownish yellow, enclosed by black veins. Membranule of hind wing vestigial, white. Wings broad at base. Two rows of postanal cells in the fore wing, and five to seven in the hind wing. Hind wing without distinct anal loop. Arculus at or near the second antenodal. Basal subcostal cross-vein present in all wings; first and fifth antenodals reinforced. Anal triangle 3-celled.

Fig. 3.



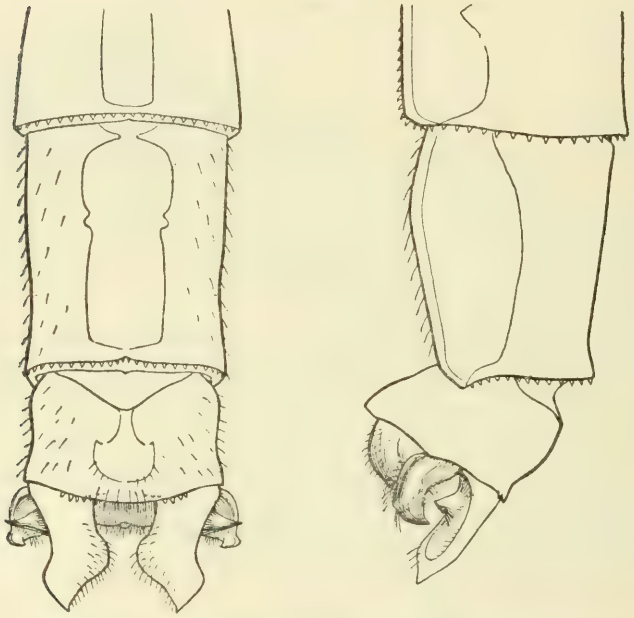
Notogomphus lecythus, sp. n. Right wings of holotype ♂.
F. W. Campion photo.

Legs: femora yellowish, lined or streaked with black; tibiæ and tarsi black (hind legs incomplete); femur of hind legs barely reaching the apical margin of abdominal segment 2, without any conspicuously long spines in the distal half.

Abdomen: segments 1 and 2 inflated; 3–6 cylindrical; 7–9 inflated; 10 about half as long as 9. Dorsum blackish, with a wide mid-dorsal yellow stripe running from base to

apex, except where it is interrupted by a narrow black ring at the apex of most of the segments ; on 2 this stripe is trilobed, on 3–6 constricted near the apex, on 7 and 8 rather narrow, on 9 wide again, and on 10 assumes the form of a spade-shaped spot. In lateral view segments 1 and 2 are broadly yellow inferiorly ; on 3 the dark area takes on the appearance of a median stripe ; 4–7 are mostly black ; and 8–10 are broadly orange inferiorly. In ventral view segments 1 and 2 are yellow, 3–7 mostly black, and 8–10 orange.

Fig. 4.



Notogomphus lecythus, sp. n. Anal appendages of holotype ♂.
P. Highley cam. luc. et del.

Auricles yellow. The first hamules on segment 2 are ill-placed for examination, but apparently they are not very strongly hooked at the tip. The second hamules are almost circular in outline, the apical hook is extremely short, and the subapical emargination is reduced to a mere notch. Anal appendages (fig. 4) dark brown ; the tips of the lower appendages black.

This fine insect can hardly be the unknown male of *N. dorsalis*, which was described from a unique female from

Abyssinia. In that species, for instance, there are black markings upon the labrum and face, the costal margin of the wings is not at all yellow, and segment 9 of the abdomen is wholly black, whereas in *N. lecythus* the labrum, face, and costa are entirely yellow, and segment 9 has a broad mid-dorsal yellow stripe.

Notogomphus immisericors, sp. n.

1 ♀ (holotype), Nandi Plateau, 5700–6200 feet, Kenya Colony, 4. vi. 1911 (*S. A. Neave*).

Length of abdomen 38·5 mm.; hind wing 32 mm.

Lips, clypeus, and frons yellow; vertex and antennæ dark orange-brown. Frons, which is carinated anteriorly, not projecting in front as conspicuously as in *N. longus*. Occiput yellow, strongly elevated at the transverse crest, which is very hairy, somewhat emarginate in the middle, and about midway between the anterior and posterior margins; a rounded swelling on each side in the angle between the occiput and the eye.

Prothorax dark orange-brown, with yellow, mostly very broad, markings in the middle line.

Meso-metathorax dark orange-brown dorsally; the mid-dorsal yellow stripe and its lateral basal expansions as in *N. lecythus*; in this specimen yellow humeral and ante-humeral lines not visible; yellow at sides and below.

Wings slightly tinged with yellow. Costa golden; other veins reddish brown. Pterostigma 4 mm. long, braced, brownish yellow, enclosed by black veins. Membranule of hind wing not visible. Wings rather narrow at base. Two rows of postanal cells in the fore wing. Hind wing with distinct anal loop, consisting of four cells; below it are two or three columns of postanal cells, with three or four cells in each; three or four postanal cells at hind margin. Arculus a little before the level of the second antenodal. Basal subcostal cross-vein present in all wings; first and fifth antenodals reinforced (sixth in right fore wing).

Legs: femora yellowish, lined or streaked with black; tibiæ and tarsi black; femur of hind legs reaching a little beyond the apical margin of abdominal segment 2, and with a double row of five or six long spines in the distal half.

Abdomen somewhat inflated at base, tapering gradually towards the apex; segment 10 about half as long as 9. A median pale stripe, interrupted by a narrow black ring at the apex of most of the segments, traverses the entire length of the dorsum; this stripe is very wide at the base, narrows

gradually until it becomes almost linear on segment 8, and widens again suddenly, so that it occupies nearly the whole of the dorsum of 9 and 10; the colour is yellowish brown on 1–8 and bright yellow on 9 and 10. Sides of abdomen yellowish brown (segments 1–7) to bright yellow (8–10), traversed by a black band, throwing off from its superior margin on segments 2–7 a few transverse projections, mostly linear in form, which invade the pale area of the mid-dorsal stripe. In ventral view segments 1 and 2 are yellow; 3–6 black; 7 yellowish black; and 8–10 bright yellow. The slightly dilated margins of segments 7–9 bordered with black denticles.

Auricles on segment 2 yellow, very small. Supra-anal tubercle yellow. Anal appendages a little longer than segment 10, blackish, straight, conical, gradually tapering towards an acute point. Vulvar lamina yellow, shorter than in *N. longus*, with a deep, almost semicircular excision apically.

1 ♀ (paratype), Yala River, southern edge of Kakumega Forest, 4800–5300 feet, Kenya Colony, 22. v. 1911 (*S. A. Neave*).

Length of abdomen 36·5 mm.; hind wing 31 mm.

Yellow humeral and antehumeral lines on each side of the thoracic dorsum faintly visible.

In the hind wings the first two postanal cells form an irregular anal loop; below the loop are two columns, with three or four cells in each; three postanal cells at hind margin.

1 ♀ (paratype), Upper Nzoia River, 5100–5400 feet, Kenya Colony, 5. vi. 1911 (*S. A. Neave*).

Length of abdomen 38 mm.; hind wing 32 mm.

Yellow humeral and antehumeral lines on each side of the thoracic dorsum not visible.

Left hind wing with distinct anal loop, consisting of three cells; in the right hind wing the first two postanal cells form an irregular anal loop; below the loop are two columns with three to five cells in each; three postanal cells at hind margin.

These three females were taken with prey, as recorded by me in 1914 (Ann. & Mag. Nat. Hist. (8) xiii. p. 499, nos. 18, 19, and 20), on which occasion they were referred to under the name of *Notogomphus ruppeli*, Selys, forma. In many

respects they are very similar to the male here described as *N. lecythus*, the most striking differences being found in the femur of the hind leg, which carries a powerful armature, and in the hind wing, which has a distinct anal loop and is considerably narrower at the base than in the Abyssinian insect mentioned.

Advantage may be taken of the present occasion to adjust two cases of homonymy in the subfamily Gomphinæ. Handlirsch's fossil (Neocomian) genus *Mesogomphus* [Foss. Ins. p. 592 (1906)] may be renamed *Necrogomphus*, nom. nov., the claim to priority of Förster's recent African genus of the same name and apparently of the same date having been conceded by Ris [Ann. S. Afr. Mus. xviii. p. 343 (1921)]. The name of De Selys's dragonfly genus *Heterogomphus* [Bull. Acad. Belg. xxi. (2) p. 27 (1854)] is preoccupied by a genus of Dynastid beetles established by Burmeister [Handb. Ent. v. p. 224 (1847)], and I propose that it should be called in future *Megalogomphus*, nom. nov.

LXIX.—*A List of Odonata collected in Tanganyika Territory by Mr. A. Loveridge.* By Herbert Campion.

The dragonflies included in a general collection of insects made by Mr. A. Loveridge in Tanganyika Territory (formerly German East Africa) have come before me for identification, and, although there are no undescribed species among them, several additions appear to have been made to the Odonate fauna of that region of East Africa. The whole of the dragonflies were taken at Morogoro, on the Dar-es-Salaam Railway, on and between the dates 26th June, 1916, and 15th March, 1918. Of the following species I have hitherto seen no specimens from Tanganyika Territory, nor any records which I can recognize as relating to it :—*Mesogomphus hageni*, Selys, *Crenigomphus hartmanni*, Först., *Ictinus ferox*, Ramb., *Orthetrum chrysostigma*, Burm., *Palpopleura deceptor*, Calv., and *Pseudomacromia torrida*, Kirby. Through the kindness of the collector and the Imperial Bureau of Entomology, a selection of Mr. Loveridge's Odonata has been secured for the British Museum (Natural History).

Family **Calopterygidæ.**

Subfamily *Calopterygin*æ.

Umma declivium, Först.

1 ♂, 9. i. 1917 ; 1 ♂, 25. xii. 1917.

Originally described from Usambara, and apparently not recorded outside Tanganyika Territory. It is readily recognized, in both its sexes, by the total absence of the pterostigma.

Phaon iridipennis, Burm.

1 ♂ (with pterostigma), 1 ♀, 3. i. 1917; 1 ♂ (without pterostigma), 2 ♀, 9. i. 1917 ; 1 ♂ (with pterostigma), 1 ♀, 31. i. 1917 ; 1 ♀, 3. v. 1917.

Subfamily *Libellagin*æ.

Libellago caligata, Selys.

1 ♀, 29. vi. 1917 ; 1 ♂, 15. iii. 1918.

Family **Agrionidæ.**

Subfamily *Protoneurin*æ.

Disparoneura sp.

1 ♂, 5. ii. 1917.

This specimen is in such poor condition that its specific identification must remain uncertain.

Subfamily *Agrionin*æ.

Pseudagrion praetextatum, Selys.

1 ♀, 26. vi. 1916; 3 ♂, 2 ♀, 4. i. 1917 ; 3 ♂, 2 ♀, 5. i. 1917 ; 1 ♀, 5. ii. 1917; 1 ♂, 1 ♀ (*in cop.*), 29. vi. 1917.

Pseudagrion sp.

1 ♀, 5. i. 1917.

The coloration of this specimen is not at all well preserved, but it seems to agree in the main with that of a female from Nyasaland determined for me by Dr. Ris as *Ps. acaciæ*, Först. At the same time there are differences, which may be important. For instance, the linear markings on abdominal segments 3–5, at all events, and possibly those on 2 and 6

also, are connected with the apical black ring in each case, instead of ending some way before the apical ring, as in *Ps. acaciæ*.

Ceriagrion glabrum, Burm.

2 ♂, 29. i. 1917.

Both these specimens have lost their anal appendages, but the brownish wings and the coloration of the body appear to justify reference to Burmeister's species.

Family **Æschnidæ.**

Subfamily *Gomphinæ.*

Mesogomphus hageni, Selys.

1 ♀, 11. i. 1917.

Abdominal segments 5–10 are missing. Except that the remaining segments are of more robust build, and that the vertex bears a large, oval, black spot, resting posteriorly upon the occiput, the specimen agrees very well with a male from N.E. Rhodesia identified by Dr. Ris. The species was originally described from Egypt, and is also known from Algeria, Abyssinia, and South Africa.

Crenigomphus hartmanni, Först.

2 ♂, 11. i. 1917; 1 ♀, 5. ii. 1917.

Originally described from the Transvaal, and subsequently recorded from Zululand and Uganda.

Ictinus ferox, Ramb.

4 ♂, 3. i. 1917.

Two species of *Ictinus* have been described from Africa, namely, *I. ferox*, Ramb., from Senegal, and *I. pugnax*, Selys, from Port Natal. Both species have since been recorded from South Africa. In his latest paper on the dragonflies of that region [Ann. S. Afric. Mus. xviii. pt. 3 (1921)] Ris has omitted any reference to *I. ferox*, and relegated *I. pugnax* to a list of reputed South African Odonata, with the comment that this species is not known to him. There are, however, in the British Museum several old specimens of an *Ictinus* labelled "Natal" or "Port Natal," one of which, at all events, has been identified by De Selys as *I. pugnax*. What is evidently the same species is also represented from Uganda and Nyasaland, but the National Collection contains no

material of *Ictinus ferox* from West Africa. From what De Selys says [Monogr. Gomph. p. 292 (1858)], it is clear that there is very little difference between the two species, and, as I am not in a position to make any comparison between East African and West African specimens, I think it advisable to apply to all the material before me Rambur's original name of *I. ferox*. M. Severin has informed me (*in litt.*, 28. ii. 23) that the male type of Rambur's species is not to be found in the Selysian collection at Brussels.

Family **Libellulidæ**.

Subfamily *Libellulinæ*.

Orthetrum brachiale, Beauv.

4 ♂, 3. i. 1917; 1 ♂, 6. iii. 1917.

Orthetrum chrysostigma, Burm.

6 ♂, 1 ♀, 3. i. 1917; 2 ♀, 5. i. 1917; 5 ♂, 6. iii. 1917.
The female and two of the males taken on 3rd January are in teneral condition.

Orthetrum guineense, Ris.

1 ♂, 6. iii. 1917.
In this species the genital hamules are somewhat variable in their shape. In the present specimen they agree exactly with those of a male from Natal, and named by Ris, which I have now before me, but differ equally from the forms shown in figs. 143 (Benguella) and 624 (Cape of Good Hope) of that author's monograph of the Libellulinæ.

Orthetrum stemmale capense, Calv.

2 ♀, 26. vi. 1917; 1 ♀, 1. ix. 1917.

Orthetrum farinosum, Först.

3 ♂, 3. i. 1917.

Palpopleura deceptor, Calv.

1 ♀, 3. ii. 1917.
Apparently a new record for Tanganyika Territory.

Palpopleura lucia, Drury.

18 ♂, 6 ♀. 1. xi. 1916; 1 ♀, 5. i. 1917; 1 ♂, 24. ii. 1917; 1 ♂, 2. iv. 1917; 1 ♂, 6. iv. 1917; 1 ♀, 8. v. 1917; 1 ♀, 10. v. 1917; 1 ♂, 1 ♀, 26. vi. 1917.

None of the males belong to the form *portia*, Drury.

Crocothemis sanguinolenta, Burm.

1 ♂, 26. vi. 1917.

Crocothemis erythræa, Brullé.

4 ♀, 1 ♀, 5. i. 1917; 1 ♂, 31. i. 1917.

Trithemis arteriosa, Burm.

10 ♂, 3 ♀, 3. i. 1917; 1 ♂, 9. i. 1917.

Trithemis annulata, Beauv.

13 ♂, 1 ♀, 3. i. 1917; 2 ♂, 5. i. 1917.

Trithemis kirbyi ardens, Gerst.

1 ♂, 5. ii. 1917.

Trithemis distanti, Kirby.

1 ♀, 18. v. 1917; 2 ♂, 26. vi. 1917.

In the male of this species neither the anterior lamina nor the genital lobes seem to be subject to much variation. With the hamules, however, the case is quite otherwise, and we are reminded of the different forms assumed by the same organ in certain species of the genus *Orthetrum*. Not only do we find the simple hooked form of hamule, characteristic of Kirby's type (see figure), but in some instances the apex is excavated into a semicircular or lunulate hollow, exactly corresponding with Ris's extreme example from Nossi Bé [Coll. Selys, Libell. p. 792, fig. 452 (1912)]. In an intermediate form of hamule the excavation of the apex is of moderate extent, and a curve is produced which is bent a little out of the true semicircular pattern. In addition to the two males from Morogoro, I have seen several others obtained by Mr. Loveridge at or near Nairobi, in Kenya Colony. Classified according to the hamule, this East African material may be arranged in three groups :—

Typical form of hamule.—2 ♂, Nairobi, 3. iv. 15; 2 ♂,

Nairobi, 1. v. 15 ; 1 ♂, Ngong, 12. vi. 15 ; 1 ♂, Kijabe, 26. vi. 15 ; 1 ♂, Nairobi, 18. xii. 15.

Intermediate form of hamule.—2 ♂, Morogoro, 26. vi. 17 ; 1 ♂, Karura, 18. x. 19 ; 1 ♂, Nairobi, 1. xi. 19.

Lunulate form of hamule.—1 ♂, Karura, 1. x. 19.

I have also examined all the material of *Trithemis distanti* in the British Museum (Natural History), and it may be useful to tabulate these males also :—

Typical form of hamule.—1 ♂, Pretoria, *W. L. Distant* (holotype).

Trithemis distanti, Kirby, type, ♂. Genitalia of abdominal segment 2. P. Highley cam. luc. et del.

Intermediate form of hamule.—1 ♂, Howick, Natal, *J. P. Cregoe* (1904. 46) ; 1 ♂, Salisbury, Southern Rhodesia, iii. 1905, *G. A. K. Marshall* ; 1 ♂, Mazoe, Southern Rhodesia, 24. xii. 05, *G. A. K. Marshall* ; 1 ♂, Broken Hill, Northern Rhodesia, 10. xi. 09, *E. C. Chubb* ; 1 ♂, Masongaleni, Kenya Colony, 31. iii. 11, *S. A. Neave.*

Lunulate form of hamule.—None.

Pseudomacromia torrida, Kirby.

3 ♂, 9. i. 1917 ; 1 ♀, 15. iii. 1918.

Widely distributed in Africa, but seemingly not recorded before from Tanganyika Territory.

Olpogastra lugubris, Karsch.

1 ♂, 3. i. 1917.

LXX.—*The Parasitic Copepod* Epibrachiella impudica, *Nordmann*. By L. Harrison Matthews, B.A., King's College, Cambridge.

(From the Zoological Laboratory, Cambridge.)

In examining some material collected at Plymouth in 1921, several specimens of a species of parasitic copepod were obtained from the gills of *Trigla gurnardus*. These were found to agree closely with the description of *Epibrachiella impudica*, Wilson (*Brachiella impudica*, Nordmann), differing only in the absence of lobes on the second maxillæ. Further investigation showed that the presence of these lobes is not diagnostic of the species, which seems to have a tendency to variation in this and other characters, and also brought to light the fact that the male had never been fully described. As four of these specimens had males attached to them, a description of the male is given below, together with a note on the variation of the female.

In 1832, Nordmann (1) described and figured both sexes, but did not give detailed descriptions of the appendages. He states that the "arms" of the female bear a projection on the outside as long as, or longer than, the rest of the "arm." In his description of the male he says that the abdomen consists of six segments; this is apparently an error, due to a wrinkled appearance perhaps caused by the preservation of his material in alcohol. This view is supported by his figure, which shows a ridging of the skin of the back, but does not show a complete segmentation.

In 1899, Basset-Smith (2) placed the species in the genus *Thysanote*, Kiφyer, incorrectly, as Wilson points out, and in this he was followed by T. and A. Scott.

T. and A. Scott (3) describe the female, figuring most of the appendages, and quote Nordmann's description of the male.

Wilson (4) describes the female in detail, but quotes Nordmann for the description of the male, and copies his figure. He places the species in the genus *Epibrachiella*, Wilson, which he founded for its reception, separating it from the genus *Brachiella*, Cuvier, to which it was originally assigned by Nordmann. With specimens of the males now to hand it will be necessary to modify Wilson's definition of the genus *Epibrachiella*.

Fig. 1.

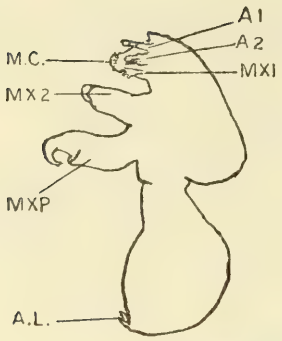
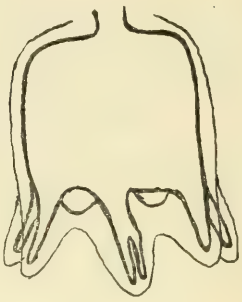


Fig. 2.



Epibrachiella impudica, Nordm.

Fig. 1.—Male, length 1·2 mm. A 1, first antenna ; A 2, second antenna ; MX 1, first maxilla ; MX 2, second maxilla ; MXP, maxilliped ; M.C., mouth-cone ; A.L., anal laminæ.

Fig. 2.—Female. Dorsal view of genital segment, to show partial fusion of the median pair of posterior processes.

Fig. 4.

Fig. 3.

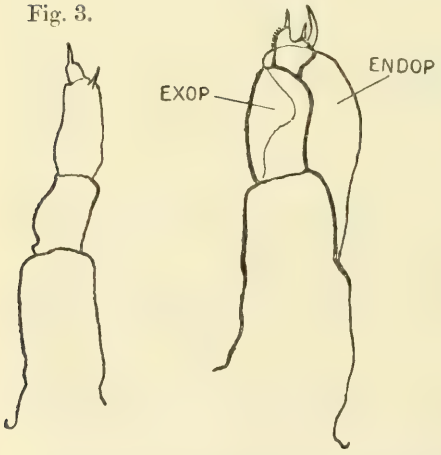


Fig. 5.

Fig. 6.

Epibrachiella impudica, Nordm. Appendages of male, drawn to the same scale with camera lucida.

Fig. 3.—Antenna 1.
Fig. 4.—Antenna 2.
Fig. 5.—Mandible.
Fig. 6.—Maxilla 1.

Description of the Male. (Fig. 1.)

The males occur on the body of the female ; two of the specimens were attached to the upper part of the genital segment—one to the lower part of it between the egg-sacs and one at the junction of the second maxilla with the cephalothorax.

The *size* of the males is from 0·9 mm. to 1·2 mm. in length.

The *head* and *body* are of about equal size, in the same line, and are separated by a narrow neck. The front of the head projects as a distinct rostrum. The trunk is unsegmented, terminating in two minute, rounded, and forwardly-directed anal laminæ.

Fig. 7. Fig. 8.

Epibrachiella impudica, Nordm. Appendages of male, drawn to the same scale with camera lucida.

Fig. 7.—Maxilla 2.
Fig. 8.—Maxilliped.

The *appendages* are paired, and consist of first and second antennæ, mandibles, first and second maxillæ, and maxillipeds.

The *first antenna* (fig. 3) is four-jointed, terminating in a spine, with a smaller one at the tip of the third joint.

The *second antenna* (fig. 4) is biramose, the exopodite with two joints, the last of which is forked. The lower division of this terminates in a small spine, and bears a row of minute teeth on its outer edge. The upper division bears a large curved spine and a smaller straight one.

The *mandible* (fig. 5) is slender and serrate, the blade being considerably narrower than the basal portion. It bears seven triangular backwardly-directed teeth, and there is a small secondary tooth after each of the first three.

The *first maxilla* (fig. 6) consists of an unsegmented endopodite and an exopodite or palp bearing a large and a small claw. The endopodite is bipartite at the distal end, each ramus ending in a single claw, and there is also a small claw at the base of the smaller outer ramus.

The *second maxilla* (fig. 7) is stout, and bears a large claw which is opposed against the outer edge of the base.

The *maxilliped* (fig. 8) is larger than the second maxilla, and bears a stout strongly-curved claw, the point of which fits into a socket in the basal part.

The *mouth* is situated at the summit of a mouth-cone, bordered with hairs and containing the mandibles, which projects at right angles from the under surface of the head.

Variation of the Female.

Basset-Smith (5) calls "var. *parva*?" certain specimens of *Epibrachiella impudica* which he obtained from gurnards at Plymouth. These were small in size and without the lobe on the second maxilla, but otherwise were identical with the type. As my specimens were also without these lobes, it seems that their absence may be a fairly common variety in the species. The species also tends to vary in another way, viz. in the number of posterior processes on the genital segment. Two of my specimens show a tendency for the median pair to fuse; one in which they are fused for half their length is figured (fig. 2).

Definition of the Genus.

Wilson (4) defines the genus *Epibrachiella* as follows:—

Female. "Of medium size (10 mm. long); cephalothorax cylindrical and of about the same length as the trunk, separated from the latter by a distinct groove; trunk strongly flattened dorso-ventrally and without pits or grooves; six short and pointed posterior processes, all about the same length; no genital process; egg-strings much longer and stouter than the processes.

"First antennæ four-jointed, the basal joint much inflated; second antennæ biramose and turned down across the frontal margin. First maxillæ bipartite, the palp with two minute spines; second maxillæ of varying length and branched at or near their centre. Maxilliped with a stout basal joint, armed on its inner margin with spines and setæ, the terminal claw with an accessory spine and a row of saw-teeth."

Male. "Head and body in the same line and separated by a well-defined groove; no dorsal carapace; trunk a little

wider than the cephalothorax and distinctly segmented, tapering posteriorly to two bluntly rounded anal laminæ.

"Second maxillæ larger than the maxillipeds, the two attached to the centre of the cephalothorax, close behind the other mouth-parts ; no data with reference to the antennæ or maxillæ."

In addition to the fresh data recorded above, Wilson's definition will, therefore, have to be modified with regard to the following points :—In the female the presence of the lobes on the second maxillæ is not constant, and in the male the abdomen is not segmented, as first stated by Nordmann.

References.

(1) Nordmann. Mikro. Beiträge zur Natur. der wirbellosen Thiere, vol. ii. p. 92, pl. viii. figs. 1–3. Berlin, 1832.
(2) Basset-Smith. "Systematic Description of Parasitic Copepods." Proc. Zool. Soc. London, 1899, pt. ii. p. 438.
(3) T. and A. Scott. "British Parasitic Copepods." Ray Soc. 1913, p. 187, pl. xxxiii. fig. 5, pl. xlix. figs. 8–11.
(4) Wilson. "North American Parasitic Copepods.—Lernæopodidæ." Proc. U.S. Nat. Mus. 1915, vol. xlvii. no. 2063, p. 715, pl. xxvi. fig. F.
(5) Basset-Smith. "Parasitic Copepoda of Fish obtained at Plymouth." Journ. Mar. Biol. Assoc. iv. 1896, p. 155.

LXXI.—*Papers on Oriental* Carabidæ.—XII.

By H. E. Andrewes.

In the following pages will be found the descriptions of one new genus and a number of new species, all from the Himalayan region. These insects come from various sources, but most of them were collected by Mr. H. G. Champion in Kumaon, Mr. H. Stevens in Sikkim, and Dr. S. W. Kemp in Assam (Abor Expedition). Except as otherwise indicated, the type-specimens are in my collection.

I regret to find that the name of *Chlænius asper*, recently used by me in describing a new species from Indo-China (Trans. Ent. Soc. Lond. 1921, pp. 176 and 190), is already preoccupied by Chaudoir, and I propose therefore for my species the new name of *C. trachys*.

Broscini.

Axonya, gen. nov.

Body shorter and more compact than in *Broscus*, the

prothorax less constricted behind, the elytra with squarer shoulders.

Head rather wide, with shallow frontal furrows, temporal ridges obsolete but visible at extremities, neck only slightly constricted; eyes large, moderately prominent, a single supraorbital seta; ligula truncate at extremity and bisetose, paraglossæ rudimentary, shorter than ligula; labrum short, sexsetose, clypeus bisetose, with a longitudinal furrow on each side; mandibles short but strong, slightly curved, with a seta in the scrobe; mentum wide, with a short sharp simple tooth in the sinus, epilobes wide, lobes slightly rounded at sides, the apex with an indentation on each side just outside the point where lobes and epilobes join; maxillæ sharply hooked at apex, with few but stiff bristles, mingled with finer hairs, on inner margin; palpi with last joint in both sexes nearly cylindrical, truncate at apex, in maxillaries quite twice as long as penultimate, in labials a little longer only, the penultimate of latter bisetose; antennæ reaching base of prothorax, joint 3 a little longer, 2 considerably shorter than the others, 4 with apical half setose. *Prothorax* cordate, moderately contracted behind, and slightly constricted, one marginal seta only at apical fourth. *Elytra* unbordered at base, side-margin hardly sinuate behind, ending in a blunt tooth in front, opposite stria 5, scutellum distinctly visible between the elytra at base; 9-striate, without scutellary striole, 1–2 and 7–9 reaching apex, 3–6 shorter, 7 and especially 8 deep near apex, 7 more or less interrupted opposite point where 3–6 terminate. *Venter* with the segments bisetose, apical segment having on each side one seta in ♂, two placed very close together in ♀. *Legs* short, coxæ contiguous, neither femora nor tibiæ dilated, tarsi glabrous above, joint 1 about equal to 2+3, ♂ with three joints (in front pair only) dilated and clothed beneath with scale-like hairs.

The position of the scutellum between the elytra distinguishes this new genus from its Palæarctic congeners, though it can just be seen both in *Miscodera* and *Craspedonotus*. The hind seta on the prothorax is wanting, but I do not detect this either in *Miscodera* or *Broscosoma*. The apical part of antennal joint 4 is setulose, as it is in *Broscosoma*; in *Chætobroscus* the setosity commences on the apical half of joint 3.

Axonya championi, sp. n.

Length 9·5–11·0 mm.; width 3·6–4·0 mm.

Dark green, shiny, metallic green along margins of

upper surface; underside black, venter piceous; joints 1–4 of antennæ (rest fuscous), palpi, labrum, and tarsi ferruginous, femora and tibiæ flavous. Body winged, glabrous.

Head moderately convex, a distinct clypeal suture, ending on each side in a pore, middle of front and vertex smooth, or nearly so, the foveæ and neck coarsely punctate. *Prothorax* convex, hardly wider than head, and very little wider than long, about equally contracted at extremities, sides of base oblique close to angles, the front angles distinct and not much rounded, sides finely bordered, gently and evenly rounded to basal fifth, and there rather strongly sinuate, so that the rectangular hind angles project a little laterally; front transverse impression obsolete, hind one distinct but not deep, no foveæ, median line rather fine, not reaching extremities; surface coarsely but not very closely punctate, more strongly along base, nearly smooth on disk, except near median line. *Elytra* ovate, convex, three-fourths as wide again as prothorax and quite half as long again as wide; rather deeply punctate-striate, the outer striæ not quite reaching base, 9 punctate like the rest, without setæ, all deeper near base than apex, intervals moderately convex, 3 without pore. Beneath the body is coarsely punctate, though nearly smooth along middle line, venter punctate at sides of base only, prosternal process unbordered, glabrous, metasternal process more or less bordered by a row of punctures, metepisterna elongate.

Punjab: Kangra and Nalagar (*G. Babault*). United Provinces: West Almora and Haldwani (*H. G. Champion*); Dehra Dun (Forest Res. Inst.); Lucknow, Kathgodam (*S. W. Kemp*), Bijnor, and Nainital (Ind. Mus.). Sikkim: Birik in the Tista Valley and Namsu (*H. Stevens*). Assam: Abor Expedition, between Pasighat and Kobo, Dihong River (*S. W. Kemp*—Ind. Mus.); Bhutan frontier, Mangaldai (*S. W. Kemp*—Ind. Mus.). "India" (British Museum).

Mr. Champion says "Common on river banks in wet places. Runs freely on the water."

Anchomenini.

Anchomenus relucens, sp. n.

Length 7·5–9·0 mm.; width 3·0–3·4 mm.

Black, shiny, elytra dark relucent bluish-green; antennæ (except joint 1), palpi, tibiæ, and tarsi ferruginous, all of them (including the tarsal joints) darker towards apex.

Head rather small, convex, eyes flat, neck faintly constricted, frontal foveæ short and shallow, antennæ rather thick, joints 1–3 glabrous, surface shiny. *Prothorax* moderately convex, considerably wider than head and a little wider than long, base truncate, apex widely emarginate, sides finely bordered and evenly rounded, without sinuation, reflexed and moderately explanate, more widely behind, a seta just before middle, hind angles obtuse and strongly rounded; median line and transverse impressions all fairly marked, foveæ rounded and moderately deep, surface smooth, with a few faint wrinkles. *Elytra* oval, convex, half as wide again as prothorax, and as much longer than wide, basal border emarginate on each side and forming an obtuse angle with side-border at shoulder; striæ fine, hardly perceptibly crenulate, intervals flat, 3 with three small but distinct pores, surface smooth. Underside smooth, metepisterna barely half as long again as wide, venter uneven at sides, last segment ♂ with one seta, ♀ with two on each side. Meso- and metatarsi bisulcate, joint 4 distinctly emarginate in protarsi, but very faintly in two hind pairs, joint 5 ciliate.

A little smaller than *A. chinensis*, Boh., more shiny, and differently coloured. Head narrower, with smaller and flatter eyes; prothorax smoother, the sides distinctly explanate, no seta at hind angle, elytra more finely striate, striæ impunctate, the border forming a more distinct angle at shoulder.

Sikkim: Tonglu, 10,000 feet, Gopaldhara and Lachung (*H. Stevens*), also Darjiling, numerous examples. There are specimens of this species in the Helfer collection at Prague labelled "Tenasserim," I think almost certainly in error.

Onycholabis acutangulus, sp. n.

Length 10·0–11·0 mm.; width 3·3–3·9 mm.

Black, sometimes piceous, shiny; joints 1–4 of antennæ and legs flavous, rest of antennæ and buccal organs ferruginous.

Head convex, smooth, very shiny, eyes prominent, genæ sloping moderately, neck a little constricted at sides, frontal foveæ deep, rounded, surface near them somewhat striate. *Prothorax* cordate, moderately convex, as wide as head and barely wider than long, base truncate, apex widely emarginate, front angles sharply rectangular, sides with a fine reflexed border, gently rounded in front, then sharply contracted to a sixth from base, and strongly sinuate, so that

the slightly acute hind angles project a little laterally, a seta (sometimes two) not far from front angle, another on hind angle; median line distinct, ending in a fovea behind at a fourth from base, front transverse impression clearly marked in middle, basal foveæ deep, near hind angles, and continued for some little distance forwards; surface with some fine wrinkles, closely punctate along base and in the elongate foveæ. *Elytra* convex, rather less than twice as wide as prothorax, two-thirds as long again as wide, sides nearly parallel, apex rather pointed, shoulders square; striæ fairly deep and very clearly punctate, though less so behind, suture a little raised, intervals slightly convex, 3 with a pore at basal third and a second behind middle. Sterna rather coarsely punctate, middle of metasternum and venter smooth, prosternal process not bordered, metepisterna elongate, ventral segments with a single seta, last one ♀ with 3 or 4 on each side. Upper surface of tarsi grooved along middle and at sides, joint 4 emarginate.

Distinguished at once from *O. melitopus*, Bates, by its wider and much more sharply angled prothorax, the elytra shorter and more deeply punctate-striate. The hind puncture on interval 3 is often wanting in Bates' species.

Kumaon: West Almora and Haldwani (*H. G. Champion*); Dehra Dun (*Dr. M. Cameron* and *S. N. Chatterjee*—Forest Res. Inst.). Assam: Abor Expedition, Yambung, 1100 feet (*Dr. S. W. Kemp*—Ind. Mus.). The type is in the British Museum.

Colpodes sikkimensis, sp. n.

Length 12·0 mm.; width 4·25 mm.

Deep blue, shiny, elytra usually with a violet tinge, underside blue-black, antennæ and tarsi piceous-black, palpi and apex of venter dark ferruginous.

Head convex, constricted behind, with well-marked, curved genæ, eyes small, hemispherical (as in *brunneus*, Macl., and *æneipennis*, Dej.), frontal foveæ deep, a pair of rounded foveæ on vertex, hind supraorbital large and distant from eye, front one apparently wanting, antennæ filiform, surface smooth, substrigose at sides in front. *Prothorax* convex, a little wider than head, and slightly transverse, base bisinuate, oblique close to angles; front angles obtuse but hardly rounded, sides formed by two nearly straight lines, meeting just before middle and forming a very distinct and slightly obtuse angle, behind which the margin is explanate, reflexed, and faintly sinuate, hind angles sharp and barely more than right, a seta at median and hind angles; median line and

hind transverse impression fairly deep, basal foveæ merging in the explanate side-margin, which is strigose-punctate, a few fine punctures along base, surface generally smooth, with some faint striæ. *Elytra* convex, subovate, but with well-marked shoulders, the sides slightly sinuate both behind shoulder and near apex, not mucronate, two-thirds as wide again as prothorax, and nearly as much longer than wide; striæ deep and strongly crenulate, intervals convex, more so at sides and behind, 3 with three pores at a fourth, a half, and three-fourths respectively, surface smooth, though with some minute punctures. Underside smooth along middle, sides of metasternum and its elongate episterna closely punctate, venter rugose-striate along sides. Tibiæ outwardly sulcate (on apical half only); tarsi wide, upper surface dull, plurisulcate, joint 4 bilobed, inner lobe slightly longer in protarsi, outer one in meso- and metatarsi, 5 not ciliate.

I know of no species nearly akin to this, which appears to come at the extreme end of Chaudoir's table, but it will easily be identified by its angulate prothorax.

Sikkim: Gopaldhara (*H. Stevens*). Bhutan: Maria Basti (*L. Durel*) and Pedong (*A. Desgodins*). "India" (British Museum). For the two Bhutan specimens I am indebted to Mr. R. Oberthür.

Colpodes vikara, sp. n.

Length 10·0–11·0 mm.; width 3·8–4·3 mm.

Brown, shiny, head and prothorax piceous, elytra more or less æneous.

Head convex, smooth, frontal impressions fairly deep, a shallow rounded fovea on each side of vertex, eyes rather flat, genæ very long, gently curved, and sloping gradually to the constricted neck, antennæ long and filiform. *Prothorax* relatively small, a little wider than head and very slightly transverse, both base and apex truncate and narrowly bordered, sides bordered and reflexed, somewhat explanate behind, rounded evenly to a fifth from base, then suddenly contracted and rather sharply sinuate, a single seta on the border just before the contraction (where the border becomes obsolete), front and hind angles inconspicuous, adjoining neck and peduncle respectively; front transverse impression rather deep, hind one slight, median line distinct, a slight fovea surrounding it at a third from base, basal foveæ deep and elongate, surface faintly wrinkled. *Elytra* elongate-ovate, but with well-marked shoulders, nearly two and a half times as wide as prothorax and two-thirds as long again as

wide, sinuate on each side near apex, with a re-entrant angle at suture, base truncate, depressed on each side of scutellum and at the base of stria 5 ; striate-punctate, the punctures coarse at base, diminishing in size behind, and quite disappearing near apex, 8 almost obsolete, marginal series irregular, the surface along margin very uneven, 3 with three large pores. Underside smooth, mesepisterna punctate, sides of venter very uneven, metepisterna elongate, last ventral segment ♂ with two setæ, ♀ with a row of 8 or 10 on each side. Legs slender, elongate, tibiæ not outwardly sulcate, meso- and metatarsi (but not protarsi) bisulcate, joint 4 not strongly bilobed, the lobes nearly equal, 5 ciliate.

Resembling *A. hirmocœlus*, Chaud., but larger and darker, the protarsi not sulcate, joint 5 ciliate. Head with much larger genæ, prothorax more contracted at extremities, the angles inconspicuous, elytra longer and more coarsely punctate.

Sikkim : Tonglu, 10,000 ft. (*H. Stevens*—type), 1 ex. Kumaon : Almora, Pindar Valley, 8000–11,000 ft. (*H. G. Champion*), 2 ex.

Colpodes vulpinus, sp. n.

Length 10·0 mm. ; width 3·6 mm.

Closely resembling *C. vikara*, but a little smaller and a little lighter in colour. Upper surface dark red, underside, antennæ, and buccal organs of a lighter red, elytra with bright metallic-green reflections.

Head rather narrower, the foveæ on vertex obsolete, antennæ quite as long and extremely fine. *Prothorax* similar in shape, but narrower, the sides rather less rounded, the border finer, not explanate behind, no sinuation, no marginal setæ, basal foveæ as deep, but smaller and shorter. *Elytra* rather more finely punctate, the punctures becoming obsolete further from apex, the surface not uneven along the course of the marginal series. Legs similar, but more slender, tarsal joint 5 more finely ciliate.

Sikkim : Kursceng, 1 ex., ♂. I am indebted for this specimen to Mr. C. Alluaud.

Colpodes impunctatus, sp. n.

Length 10·5 mm.; width 4·0 mm.

Another species which bears a very strong superficial resemblance to *C. vikara*, but differs in some important characters. The colour is a little darker, the elytra black with æneous reflections, the femora piceous-black, the

antennæ testaceous, a little darker towards apex. *Head* rather narrower, genæ straight, more elongate and more gradually contracted behind, frontal impressions diverging behind, foveæ on vertex slighter. *Prothorax* more quadrate, base strongly arcuate, sides less rounded, slightly bordered and reflexed in front, unbordered and only faintly reflexed behind, no marginal setæ, angles rather more distant from neck and peduncle respectively, but the hind angles are almost rounded away; median line finer, foveæ short but deep, a little removed from hind angles. *Elytra* oval, with more rounded shoulders, basal border emarginate, meeting side-border at an obtuse angle; punctures forming the striæ much finer, the surface even along the margin, intervals flat, 3 without pores. The metepisterna are elongate and strongly bordered, last ventral segment ♂ with 2, ♀ with about 5 setæ on each side. Legs similar, but tarsal joint 4 is only slightly bilobed in protarsi, emarginate in meso- and metatarsi.

Sikkim: Tonglu, Singile La Ridge (*H. Stevens*—type), 1 ex., ♂; Darjiling, 7000–8000 ft. (*R. B. Horsfall*—Ind. Mus.), 1 ex., ♀. In the latter example the disk of the prothorax is transversely striate.

Lebiini.

Dromius indicus, sp. n.

Length 5·0–6·0 mm.; width 1·8–2·0 mm.

Testaceous, disk of prothorax and head with a reddish tinge, elytra black, with the margin and two oval spots on each flavous, the front one larger and merging at sides in the border, hind one merging in apical border. In effect the elytra are flavous, with a large black cross, the bar of which is placed rather behind middle.

Head convex, smooth, not much longer than wide, contracted rapidly to neck behind eyes, frontal foveæ short and not very deep, a shallow rounded fovea on each side of vertex, adjoining eyes. *Prothorax* moderately convex, distinctly wider than head, but very little wider than long, base truncate, apex much narrower, emarginate, front angles adjoining neck, sides rounded in front, barely contracted or sinuate behind, reflexed and somewhat explanate, more widely behind, hind angles right but slightly rounded; median line, hind transverse impression, and basal foveæ all clearly impressed, though not deep, surface with some fine transverse wrinkles, a little uneven along base. *Elytra* flat, elongate-oval, truncate at extremities, rather less than

twice as wide as prothorax, quite half as long again as wide, basal border reaching stria 1; striæ moderately deep, indistinctly crenulate, intervals moderately convex, 3 with a single pore near apex, 7 with four or five pores on apical half, adjoining stria 6. Microsculpture very distinct, isodiametric on head and elytra, a little transverse on prothorax. Last dorsal segment deeply emarginate on each side; last ventral segment ♂ emarginate in middle, with two setæ on each side, ♀ with three on each side, the outermost longer than the inner ones. Each claw with four distinct teeth.

Closely allied to *D. alienus*, Bates, from Indo-China, and differing chiefly in size and colour. A little larger and with a more shiny surface, the light parts much paler, the hind spot larger and more conspicuous, the bar of the cross consequently narrower.

Sikkim: Gopaldhara, both at light and in lichen (*H. Stevens*); Kurseong (colls. C. Alluaud and H. de Touzalin); Gangtok, 6150 ft., and Mangpu, Gureil, 5000 ft. (*S. W. Kemp*—Ind. Mus.). Kumaon: West Almora (*H. G. Champion*); Lebong, 5000 ft., and Phoobsering, 5000 ft. (*H. M. Lefroy*—Pusa Coll.). Bengal: Buxar Duars (*D. Naoroji*—Pusa Coll.).

Dromius adoxus, sp. n.

Length 4·0–4·5 mm.; width 1·3–1·6 mm.

Light testaceous, elytra very pale; head (above and beneath, except clypeus and labrum), a vague patch on each side of disk of prothorax, an elytral pattern, and ventral surface (except middle of base) more or less piceous. The elytral pattern consists of (1) a sutural stripe, hardly reaching base and very narrow at apex, but extending outwards just behind middle to stria 3; (2) an elongate patch, covering the outer apical angle; (3) a narrow oblique line (often absent) joining these and extending some little way forward along interval 5.

Head smooth, frontal foveæ short and not deep, genæ sloping abruptly to the slightly constricted neck, eyes rather flat. *Prothorax* small, more quadrate than cordate, slightly wider than head and moderately transverse, base arcuate with very oblique sides, front angles strongly rounded, sides finely bordered, bisetose, explanate behind, well rounded to apical third, thence nearly straight to base, but with a slight sinuation before hind angles, which are obtuse and reflexed, though hardly rounded; median line and transverse impressions fairly distinct, basal foveæ merged in the hollow

formed by the reflexed sides, surface minutely transversely striate. *Elytra* flat, elongate, twice as wide as prothorax and quite half as long again as wide, basal border only extending inwards to stria 3 or 4; striæ very faintly impressed, with only vestiges of punctures, intervals almost flat, 1 raised near apex, 3 with a single pore near apex. Microsculpture conspicuous, isodiametric on head and elytra, moderately transverse on prothorax. Apical ventral segment with two setæ on each side in both sexes. Claws with about three small teeth.

In the form of the head like *D. quadrisignatus*, Dej., but coloured like *D. sigma*, Rossi. Prothorax as in the latter, but wider and more explanate at sides, especially behind; elytra longer and with quite a different pattern, the striæ even less evident.

Kumaon: East and West Almora, Nainital, Ranikhet (including Kosi River, 3000 feet), West Bhatkot, 6000 feet (type), Dudhatoli, 9000 feet. Taken on *Quercus dilatata* (*H. G. Champion*). Punjab: Simla Hills, Kotgarh, 7000 feet (*S. N. Chatterjee*—Forest Res. Inst.). Sikkim: Gopaldhara (*H. Stevens*). The type is in the British Museum.

Risophilus himalayicus, sp. n.

Length 4·5–5·3 mm.; width 1·5–1·9 mm.

Head and prothorax reddish, elytra black, underside testaceous; antennæ, palpi, legs, margin of elytra, and a small spot adjoining apical border light testaceous.

Head convex, smooth, with rather sloping genæ, neck only slightly constricted, frontal foveæ rather short and a little rugose, a slight depression on each side of vertex, eyes not prominent, mentum with a tooth. *Prothorax* slightly narrower than head, as long as wide, base with oblique sides, rather wider than apex, sides bisetose, bordered, gently rounded in front, sinuate behind, the angles right, projecting, and a little reflexed; median line and transverse impressions all strongly marked, surface transversely strigose, a little rough along base. *Elytra* moderately convex, oval, obliquely truncate and slightly emarginate on each side at apex, nearly two and a half times as wide as prothorax, barely half as long again as wide, basal border nearly reaching stria 3; rather deeply striate, the striæ minutely crenulate, intervals moderately convex, 3 with two pores at a fourth and near apex. The microstructure of the head and elytra is distinct and isodiametric; on the prothorax it is slightly transverse, and less visible on account of the transverse

striation. Ventral surface sparsely setulose, apical segment ♂ emarginate, with one seta, ♀ with two setæ on each side. Claws strongly toothed, outer teeth larger than inner ones.

About the same size as *R. fuscus*, Motch., but otherwise coloured. Head similar; prothorax longer and narrower, sides more sinuate, hind angles sharp, surface more strigose; elytra more deeply striate.

Kumaon: West and Central Almora, Ranikhet, Bhatkot, Khaula, 4500 feet, Swal River basin (type) (*H. G. Champion*), many examples; Naini tal, Malwa Tal, 3600 feet (*B. Prashad* and *S. L. Hora*—Ind. Mus.), 1 ex. The type is in the British Museum.

Taridius stevensi, sp. n.

Length 7·0–8·0 mm.; width 2·6–3·0 mm.

Black, moderately shiny; antennæ, palpi, labrum, reflexed margin of prothorax, and middle of metasternum more or less ferruginous; legs and an elytral pattern flavous. The margin of the elytra is flavous throughout, and the pattern consists in a flavous stripe on each elytron covering intervals 5–7, which throws out a short arm inwards at basal third to stria 2, at two-thirds expands outwards to margin, and at three-fourths expands inwards along a zig-zag line to sutural angle. This leaves a black stripe along interval 8 from base to two-thirds. Occasionally the flavous stripe is interrupted just behind middle.

Head convex, smooth, but with a few minute scattered punctures, three fine ridges on each side near eyes, of which the inner one is sometimes obsolescent, genæ contracted sharply to neck. *Prothorax* slightly convex, rather wider than head and quite half as wide again as long, base arcuate, front angles rounded, sides widely reflexed, rounded, but nearly straight behind and barely sinuate before hind angles, which are reflexed and obtuse but not rounded, a seta before middle and another on hind angle; median line short, but distinct, transverse impressions shallow, surface finely and sparsely punctate, also finely transversely rugose, especially towards hind angles. *Elytra* oval, rather flat, two-thirds as wide again as prothorax, and half as long again as wide, base a little emarginate, apex obliquely truncate, slightly emarginate on each side, the outer angles rounded; striæ fine and finely crenulate, intervals flat, 3 with two pores at a third and three-fourths, adjoining stria 3. Microsculpture very conspicuous, isodiametric on head and elytra, slightly

transverse on prothorax. Underside smooth, prosternal process shortly pilose on the declivity, metepisterna elongate, ventral segments (including apical one) with a single seta on each side in both sexes.

T. opaculus, Chaud., is larger, piceous in colour, and without elytral pattern. *T. birmanicus*, Bates, is the same size, but with quite a different pattern.

Sikkim: Nurbong, Mahanadi Valley, and Gopaldhara (*H. Stevens*); Kalimpong (*F. H. Gravely*—Ind. Mus.). United Provinces: Haldwani, Nandhaur R. (*H. G. Champion*). Orissa: Angul dist., Khondmal Hills (*J. Taylor*—Ind. Mus.).

LXXII.—*On Three new Species of* Lælaps *occurring on African Rodents.* By Stanley Hirst.

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Lælaps vansomereni, sp. n.

♀. Hairs on dorsum not very short, the posterior ones longer than the others, especially those on the narrow marginal strip left uncovered by the hinder end of the scutum. *Sternal plate* very like that of *L. nuttalli* in shape. *Genito-ventral plate* fairly wide (see measurements), being well expanded behind the coxæ; it has distinct transverse linear markings on its surface. Setæ on *venter* stouter and more numerous than in *L. nuttalli*. *Coxa of first leg with two stout spines or thorns* (instead of having a thorn and a slender bristle as in *L. nuttalli*). Second and third coxæ with stout thorns of moderate length, but there is only a very short and thin bristle on the fourth coxa.

Measurements. Length of body (not including capitulum) 710 μ–740 μ, its width ·498 μ; length of sternal plate 125 μ; greatest width of sternal plate 198 μ; least width of sternal plate 155 μ; greatest width of genito-ventral plate 235 μ.

Host: Several specimens from rodent no. 132, Busiu, S. Bugishu, Uganda, 5. iii. 1922 (*W. N. Van Someren*).

Lælaps bakeri, sp. n.

♀. Hairs on *scutum* finer than those at the sides of the body and on the venter. Posteriorly on the softer marginal

strip of integument there is the usual pair of hairs which are slightly longer than the rest. *Sternal plate* shaped much as in *L. giganteus*, etc.; it is furnished with the usual three pairs of hairs. *Genito-ventral plate* not the same shape as in *L. giganteus*, being distinctly narrower and lacking the slight concavity present in that species between the last pair of hairs (on the posterior margin). Sides and venter densely furnished with setæ which are not very long; these setæ are much stouter than those in the same positions in *L. giganteus*. Coxa of first leg ventrally with a very stout outer spinule and an inner seta; trochanter and femur with a much shorter and weaker spinule. Coxæ 2–4 each with a thorn or spine ventrally on the posterior margin, that of the fourth being the shortest; the second and third coxæ also have an anterior thorn. Femur of first leg with the usual long dorsal hairs.

Measurements. Length of body (not including capitulum) 1480 μ–1550 μ; greatest width of body 1080 μ–1150 μ; length of sternal plate 320 μ, its width (in middle) 310 μ; greatest width of genito-ventral plate 320 μ.

Hosts: African rodents. The specimen selected as type is from *Arvicanthis* sp., Baker's no. 35. Killed near house, Soroti Teso, Uganda, 17. v. 1922.

Lælaps parvulus, sp. n.

♀. Body oval, being considerably narrowed anteriorly, but gradually widening posteriorly, its greatest width being just behind the last coxæ. *Scutum* rather sparsely furnished with hairs and they are short, with the exception of a longer pair in the middle of the posterior margin. The softer marginal strip at the posterior end of the dorsum is furnished with numerous comparatively long hairs, including a widely separated posteriormost pair which are rather conspicuous, being slightly longer and more salient than the rest. *Sternal plate* long and not very wide, the posterior margin being concave; surface of this plate ornamented with scale-like markings; the usual four pairs of hairs are present on this plate. *Venter* densely furnished with hairs, a few being short, but the posterior ones about as long as those on the soft posterior part of the dorsum. *One of the principal features characterising this species is the presence of a very short but stout conical tooth or spur on each half of the base of the capitulum* (base of palp). Coxa of first leg with two stout spinules; trochanter of this leg with three stout spinules ventrally, two being quite small; its femur ventrally with a minute stout spinule and a longer seta. Coxæ

2–4 with the anterior outer edge provided with a series of minute denticles ending ventrally in a tooth or spinule; there is also a spinule on the posterior margin of these coxæ, that on the fourth coxa being small and thin. Femur of first leg dorsally with a pair of long setæ of unequal length; shorter setæ are also present on the dorsal surface of the patella of this leg.

Host: *Arvicanthis dorsalis*, South Africa (*Peringuey Coll.*).

Measurements. Length of body (not including capitulum) 730–750 μ; its greatest width (behind posterior coxæ) 550 μ, width at level of first coxæ 240 μ, at second coxæ 375–410 μ; length of sternal plate 150 μ; its width near the middle 137–152 μ, its width at posterior margin 167–177 μ; greatest width of genito-ventral plate 217 μ.

Host: *Arvicanthis dorsalis*, South Africa (*Peringuey's Coll.*).

LXXIII.—*Three new Mammals from Peru.*

By Oldfield Thomas.

The British Museum has received a small collection of mammals collected by Mr. Latham Rutter on the Rio Pachitea, Peru, and its affluent the Rio Palcazu, and I find the three following to need description as new:—

Callicebus rutteri, sp. n.

A reddish-brown species with bright red head and limbs, and a black and grey tail. Back warm reddish brown, not so greyish as in *caligatus* and its allies. Head rufous, the cheeks and underside brighter and richer, a deep rich "morocco-red"; forehead with a narrow band of whitish, not so broad as in *leucometopa*, nor so whitish as in *subrufus*. Hair on ears red. Limbs brilliant rufous distally above and wholly below, the shoulders and hips more brownish, like the back, but without the distinct greyish area found in *subrufus*. Hands and feet wholly rich rufous, except that there are a few whitish hairs at the tip of the toes. Throat, chest, and narrowed middle area of belly bright rufous, in continuity with the inner side of the fore-limbs. Tail greyish black proximally, the tip for about three inches above and eight inches below white or greyish white.

Dimensions of the type (measured in the flesh):—

Head and body 242 mm.; tail 390; hind foot 85; ear 30.

Hab. Rio Pachitea, Upper Ucayali, Peru. Type from Puerto Leguia, 1500′.

Type. Adult female skin without skull. B.M. no. 23.10.16.1. Original number 57. Collected 31 May, 1923, by Latham Rutter. Presented by Oldfield Thomas.

This very handsome Titi Monkey, which I have named in honour of its collector, would appear to be nearest to *C.–subrufus*, Elliot, of which the type is in the British Museum. It differs, however, by its generally more rufous colour, the more rufous crown, the absence of the marked greyish areas on the shoulders and hips, and by its practically wholly rufous hands and feet.

Anthorhina peruana, sp. n.

Apparently most closely allied to *A. longifolium*, Wagn., with which it shares the non-crenulated edges of the lancet and the inconspicuous dorsal whitish line. Ears, however, much shorter than in that animal, their length, moistened, only 18·5 mm., while Peters gives 23 mm. as their length, dried, in the type of *longifolium*. General colour blackish, sides of lancet thinly fringed. No postauricular lightish patches, as there are in *A. picata*. Under surface brownish black, the hair narrowly tipped with dull whitish.

Skull very like that of *A. crenulata*, the bullæ about as in that animal, much smaller than in *A. picata*. Nasal opening continued a short way back in the middle line.

Dimensions of the type (measured on the skin) :—

Forearm 49 mm.

Lancet (wet) 16 ; ear (wet) 18·5, its front edge 16·5.

Third finger, metacarpal 44·5, first phalanx 13·5 ; lower leg and foot (c. u.) 33.

Skull : greatest length 21·2 ; condylo-basal length 18·3 ; zygomatic breadth 12 ; mastoid breadth 11 ; greatest diameter of bulla 4·2 ; front of canine to back of m^3 8.

Hab. Rio Pachitea, Peru. Alt. 1500′.

Type. Adult female. B.M. no. 23.10.16.12. Original number 80. Collected by Latham Rutter and presented by Oldfield Thomas.

This Peruvian representative of the rare genus *Anthorhina* appears to be most like *A. longifolium*, described by Wagner from Matto Grosso and re-described later by Peters. But its ears are so much shorter that it is evidently distinct, and it is not impossible that *longifolium*, with its large ears, will prove to have the larger bullæ found in *A. picata*, instead of the smaller ones of *crenulata* and *peruana*.

Proechimys pachita, sp. n.

Most nearly allied to *P. brevicauda* of the Huallaga. Externally very like that animal except that the belly is wholly white—but even this Mr. Osgood has shown to occur not infrequently in forms from the typical region of *brevicauda*. Feet brown. Skull also with the general characters of that of *brevicauda*, but the palatal foramina—so diagnostic in this group—much longer, as long as the three molars taken together. In *P. bolivianus* they are equally long, but that animal has very much larger bullæ. Hamular processes long and rather narrow, not particularly spatulate behind.

Dimensions of the typical skull:—

Greatest length 59 mm.; condylo-incisive length 49; zygomatic breadth 27; nasals 23; interorbital breadth 13; palatal foramina 7; length of bulla, measured parallel with the median line of the skull, 9·6. Cheek-tooth series 8·9. Another skull, older than the type, only measures 51 mm. in total length.

External measurements of another specimen:—Head and body 220 mm.; tail 123; hind foot 41; ear 19.

Hab. Rio Pachitea, Peru. Type from Puerto Leguia, 2000′.

Type. Adult skull; male. B.M. no. 23. 10. 26. 40. Original number 26. Collected by L. Rutter and presented by Oldfield Thomas. Four specimens.

Mr. Rutter also collected examples of *P. simonsi*, distinguishable by its short palatal foramina, at Mairo, Rio Palcazu, in the same region.

Mr. Osgood's observations on the variation in the colour of of *P. brevicauda* show how little importance can be attached to external characteristics in this difficult genus.

LXXIV.—*A new Cyprinoid Fish from Tanganyika Territory, and Two new Fishes from Angola.* By J. R. Norman.

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Xenobarbus, gen. nov.

Closely allied to *Barbus*, from which it differs in having a pair of barbels on the lower jaw, in addition to a pair of barbels at the angles of the mouth.

Xenobarbus loveridgei, sp. n.

Depth of body $4\frac{3}{5}$ to $4\frac{3}{4}$ in the length, length of head $3\frac{3}{4}$ to 4. Snout rounded, much shorter than diameter of eye, which is $2\frac{1}{2}$ to 3 in length of head; mouth terminal, its width about $4\frac{1}{2}$ in head; jaws equal anteriorly; lips feebly developed; mandibular barbels shorter than eye, inserted near anterior end of lower jaw, widely separated; barbels at angles of mouth somewhat shorter. Dorsal 10–11, with 7–8 branched rays; origin about equidistant from end of snout and base of caudal; third simple ray strong, bony, its upper part with a few strong serrations on posterior edge. Anal 8, with 5 branched rays, not nearly reaching caudal. Pectoral about $\frac{3}{4}$ length of head, reaching pelvic or not quite so far; base of pelvics below anterior dorsal rays. Caudal peduncle about twice as long as deep. Scales radially striated, 38 in a longitudinal series, 16 round caudal peduncle. A narrow dark lateral stripe and a dark spot at base of caudal.

Three specimens, 30–45 mm. in total length, from Sagayu Mwanza, Tanganyika Territory; collected and presented to the British Museum by A. Loveridge, Esq.

This species agrees in most characters with *Barbus litamba*, Keilhack, and *B. trevelyani*, Günther, but differs in having a pair of barbels on the lower jaw.

Kneria marmorata, sp. n.

Depth of body $7\frac{2}{3}$ in the length, length of head a little more than 6. Head distinctly broader than deep, $1\frac{2}{3}$ times as long as broad; snout about equal to postocular part of head; width of mouth about $\frac{1}{3}$ length of head; eye superolateral, invisible from below, 5 in head; interorbital width $2\frac{1}{2}$ in head. Dorsal 11, with 8 branched rays, origin a little in front of base of pelvics and about equidistant from end of snout and base of caudal; last simple ray nearly as long as head. Anal 8, with 5 branched rays, much nearer base of caudal than base of pelvics. Pectoral nearly equal to length of head. Caudal forked with pointed lobes. Caudal peduncle about twice as long as deep. About 130 scales in a longitudinal series just above lateral line. Yellowish brown above, marbled with darker brown, pale yellow below; pectorals and pelvics greyish; 5 or 6 oblique blackish bands on each caudal lobe.

A single specimen, 118 mm. in total length, from the

Kokema River, a tributary of the Quanza River, Angola; altitude 4000 ft.; collected by Major H. de Laessoe, D.S.O., M.C., and presented to the British Museum by H. F. Varian, Esq.

Near *K. cameronensis*, Boulenger, differing particularly in the shorter head, more anterior insertion of dorsal, and the smaller scales.

Synodontis laessoei, sp. n.

Depth of body $4\frac{2}{5}$ in the length, length of head $3\frac{1}{2}$. Head a little longer than broad, rugose above to opposite anterior edge of eyes; snout obtusely pointed, $1\frac{1}{5}$ times length of postocular part of head. Eye supero-lateral, $5\frac{1}{4}$ in length of head, $1\frac{3}{4}$ in interorbital width. Lips moderately developed. Præmaxillary teeth forming a short and rather broad band; length of movable mandibular teeth about $\frac{1}{2}$ diameter of eye; 28 in number. Maxillary barbel unbranched, with a narrow marginal membrane at base, $1\frac{1}{5}$ times length of head, not reaching middle of pectoral spine; outer mandibular barbel with a few short, simple branches, twice as long as inner, which has stouter, mostly bifid branches. Gill-opening not extending downwards beyond base of pectoral. Occipito-nuchal shield rough like the occiput, simply convex, longer than broad, with pointed posterior process. Humeral process longer than broad, weakly keeled, more or less sharply pointed, extending back almost as far as occipito-nuchal process. Dorsal I 7; spine nearly $\frac{4}{5}$ length of head, feebly curved, anterior edge smooth except for two or three serrations at the tip, posterior edge strongly serrated. Adipose fin nearly four times as long as deep, its length about equal to its distance from rayed dorsal. Anal 12, with 11 branched rays; angular. Pectoral spine nearly as long as head; strongly serrated on both edges, the serrations on the inner edge being much stronger than those on the outer; not reaching pelvics. Caudal forked, upper lobe the longer. Caudal peduncle longer than deep. Greyish; anal and caudal with some dark spots.

A single specimen, 145 mm. in total length, also from the Kokema River; collected by Major H. de Laessoe and presented by H. F. Varian, Esq.

This species differs from *S. multimaculatus*, Boulenger, in the longer snout, more strongly serrated dorsal spine, and shorter adipose fin; it differs from *S. steindachneri*, Boulenger, chiefly in the longer snout and in the form of the mandibular barbels.

LXXV.—*Note on* Gossyparia mannifera, *Hardw.*

By E. Ernest Green, F.E.S., F.Z.S.

I have recently had occasion to look up the early descriptions of the Coccid listed in Mrs. Fernald's 'Catalogue' (p. 68) under the name of *Gossyparia mannifera*, Hardwick.

The synonymy is there given as follows:—

Chermes mannifer, Hardw. Asiatic Researches, xiv. pp. 182–186 (1822).
Coccus manniparus, Ehrenb. Symb. Phys. dec. i. tab. x. (1829).
Gossyparia manniparus, Sign. Ann. Soc. Ent. Fr. (5) v. p. 214 (1875).
Gossyparia mannifera, Giard, Bull. Soc. Ent. Fr. (6) ii. p. cclxxiii (1892).

Hardwick (*loc. cit.*) presents figures of an insect which is clearly not a Coccid. The author himself describes it as an Aphid, and refers it to the genus *Chermis* (sic); but, from his figures, the insect would appear to be a Psyllid. He describes the so-called "manna" as a flaky accumulation of white waxy matter resulting from filaments secreted and shed by the insects. This author's material was obtained in Persia.

Ehrenberg describes and figures, under the name *Coccus manniparus*, a totally different insect, which appears to be a true Coccid. The structural details given are insufficient for an exact determination of the genus, but, such as they are, they suggest that his species should be referred to *Eriococcus* rather than to *Gossyparia*. The insect is represented as being completely enclosed within a distinct, felted, outer sac. His figure of the "manna" shows a viscid reddish mass, dependent from the infested tamarisk branches, which would appear to be an excretory (rather than secretory) product. Ehrenberg's material was collected "in montibus sinaiticis," which I take to indicate the mountains of Sinai.

Signoret does not profess to have seen the species. He contents himself with quoting the more material parts of Ehrenberg's description.

Giard records the acquisition of fresh material, from Algeria, which he attributes to Hardwick's species, but refers to the genus *Gossyparia*. He also quotes Ehrenberg's description. It is not clear whether he was actually dealing with Hardwick's *Chermes mannifer* or Ehrenberg's *Coccus manniparus*, or, possibly, with yet a third distinct insect. Giard was well acquainted with the appearance and structure of the Coccidæ, and would scarcely have attributed to the genus *Gossyparia* any insect resembling Hardwick's figures.

The outcome of this investigation should be the removal of Hardwick's *Chermes mannifer* from the list of Coccidæ, and the establishment of Ehrenberg's *manniparus*, which I would refer (provisionally) to the genus *Eriococcus*.

Camberley,
25th September, 1923.

BIBLIOGRAPHICAL NOTICE.

Game Birds and Wild-Fowl of Great Britain and Ireland. By Archibald Thorburn, F.Z.S. Imperial 4to. London: Longmans, Green, and Co., 1923. Price £5 5*s.* net.

"Of the writing of books there is no end," and, of those written, surely a quite unfair proportion have been in connection with the birds of Great Britain. One more has now been added to their number, but, as it is both written and illustrated by Mr. A. Thorburn, no one will fear before perusing its pages that it will prove one more too many. Too many books are published on our English birds which merely repeat what has already been written and said a hundred times previously, and often, indeed, said better. Few of them add one iota to the sum total of our knowledge, or give one moment of artistic pleasure to those whose shelves they help to fill. The present book, though it may not make us much wiser, will certainly succeed in giving us all pleasure.

In this work Mr. Thorburn deals with the birds generally accepted as game-birds in this country, and includes all those birds protected by the game-laws, all swans, geese, and ducks, and, in addition to these, accepts those numerous "wild-fowl," such as curlew, lapwing, and quail, which the gunner shoots and both gourmand and gourmet eat, as coming within his purview. Accordingly, we get a few more delightful plates and a great deal more information, perhaps less widely known than that which refers to the more legitimate game-birds.

The letterpress allotted to each species is cut down to the minimum necessary to enable the one volume to cover so large a field; but, though brief, it contains concise and accurate notes on distribution, breeding area and habits, as well as short descriptions of male, female, and young. We observe with pleasure many excellent quotations from information given by the author's friend, Mr. Hugh Wormold, on the immature Anatidæ, which will greatly assist in discriminating the young of the various species of ducks from one another. This is often a task of the greatest difficulty, even to those who flatter themselves that they really know their ducks, and Mr. Thorburn has scored a point in obtaining and broadcasting Mr. Wormold's notes.

The scientific names given to the birds upon which the author

discourses are taken from Howard Saunders's Manual, and it is, perhaps, a pity that some more modern authors have not been consulted. However, as this beautiful book has been produced for the sportsman and field-naturalist rather than for the scientist, this objection is not of great importance.

The author's remarks on the various species and subspecies of pheasant introduced into England for sporting purposes are very interesting, and the excellent plate which accompanies them is worth the attention of all game-bird lovers, whether scientific or not. We could wish that Mr. Thorburn had told us as much about the great variations which occur in the plumage of the partridge, some of which are individual, whilst others are geographical; but he has wisely left this most puzzling of questions for the scientists to fight over.

Anent the red-legged partridge—or Frenchman, as he is so often called,—the author refers to two interesting letters written about the year 1770, showing that about this time a number of these birds were obtained from France and imported into England by Charles II. The red-legged partridge we may note, however, has a wider range than that ascribed to it in this work, extending in various geographical firms well into Asia. On the other hand, the quail does not appear in its typical form so far east as Japan, but is replaced by another subspecies known as *Coturnix coturnix japonica*.

When we turn from the letterpress to the plates, it is easy to admire but very difficult to find fault. On the whole, they must be among the most beautiful game-bird plates ever painted or produced. Each is in itself a fascinating picture, apart from the birds themselves, whilst the latter show not only the work of an artist but the knowledge of the ornithologist. Mr. Thorburn tells us that his aim has been to represent these birds grouped in their natural surroundings rather than to make scientific plates of the various species; we would, however, especially congratulate him on not having indulged artistic licence at the expense of correctness in the coloration of his subjects.

Of all the plates, the one which possibly the majority of people will admire the most is the beautiful scene containing the gadwall, tufted duck, and common pochard, whilst the one we admire the least is that containing the swans and the sheld-duck. It is not easy to make the swan appear graceful on land, more especially the whooper, which will not conform to tradition and curve his neck gracefully. The swans depicted do *not* look graceful, whilst the strain of posing for their photographs in such aristocratic company has induced the shel-ducks also to stretch their necks to an uncomfortable degree.

This book is one which every lover of bird-pictures will certainly want to possess, but, at the same time, it is equally one which will be of practical use to every sportsman and field-naturalist.

"Of the making of books there is no end," yet we shall venture to hope for companion volumes to this in the near future.

E. C. S. B.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 20th, 1923.—Prof. A. C. Seward, Sc.D., F.R.S., President, in the Chair.

The following communication was read:—

'The Deposits of Paleocene Mammalia in Belgium.' By Prof. Louis Dollo, Sc.D., For.Mem.G.S., and Prof. P. Teilhard de Chardin, D.Sc.

At present, four deposits containing Paleocene Mammalia are known in Belgium: Erquelinnes (Hainaut), Orsmael (Brabant), Leval (Hainaut), and Vinalmont (Liége). Unfortunately, until quite recently, the mammalian remains obtained therefrom were scanty in number and poor in variety.

In view of the importance of the problems which presented themselves, one of the Authors (L. D.), determined to resume the methodical exploration of the deposits of Orsmael and Erquelinnes. After researches extending over two years, he succeeded in collecting more than a thousand teeth of small mammals in the Upper Landenian of Orsmael. These teeth were accompanied by a number of small bones, and remains of reptiles and fishes were also found.

Although the Erquelinnes deposit was not quite so productive, a fauna of small mammalia was found therein, which allows of its correlation with the Orsmael occurrence.

The diggings are being continued, but the material already accumulated justifies the immediate publication of certain conclusions. The study of the Mammalia has been undertaken by one of the Authors (P. T. de C.) who is a specialist in that subject, and he proposes to publish an illustrated monograph thereon in the Memoirs of the Brussels Museum. The Reptilia are being studied by the other author (L. D.), and he will shortly publish a description of them.

The Authors have arrived at the following conclusions:—The four known deposits containing Paleocene Mammalia in Belgium are of Sparnacian age (=Upper Landenian). They have yielded remains of Marsupials, Insectivora, Carnivora, Rodents, Condylarthra, Amblypoda, Perissodactyls, and Primates. The presence, in the fluviatile gravels of Orsmael, of Rodents, Primates, and *Phenacodus*, together with the absence of Multituberculata, and the existence, at the corresponding horizons at Erquelinnes, of the same fauna (with *Coryphodon* and *Hyracotherium*) unmistakably indicate the Sparnacian age of those deposits.

Up to the present, no remains of Thanetian mammalia have been discovered in Belgium, and therefore the continuance into the Sparnacian of Belgium of the genus *Adapisorex* recorded from the Thanetian of Cernay is a fact worthy of notice.

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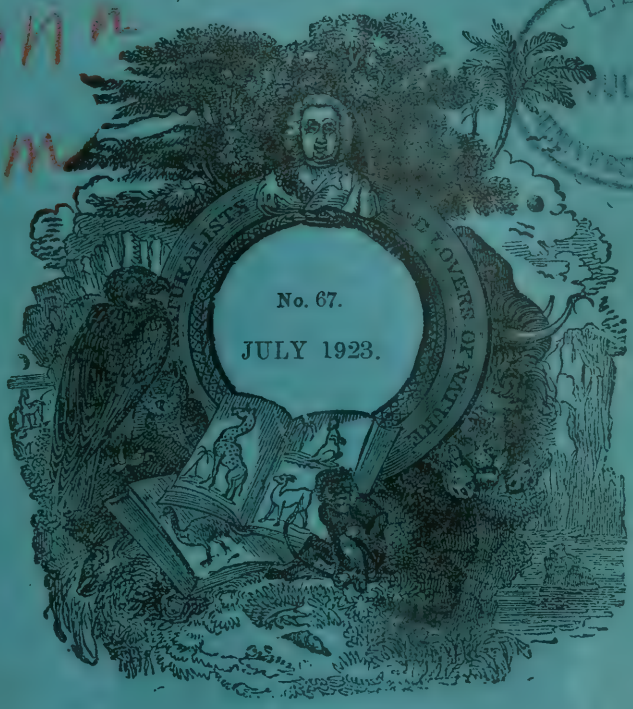

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